ARCHIVES OF OPHTHALMOLOGY.

ON THE PROTECTION OF THE CORNEA IN SOME SIGHTLESS STUMPS.

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FOR those who believe that all sightless stumps should be enucleated, this paper can have no interest. Personally, I believe that many such stumps are worth preserving as they make the best possible support for an artificial eye; and as being entirely harmless if, after once becoming quiet, they can be kept from being infected. Where such a stump has any considerable amount of cornea left, this sometimes becomes irritated when an artificial eye is worn, and often drives the patient to the oculist with the request that the stump be removed in order that a shell may be worn with comfort. In another class of cases, the amount of cornea left is so small that it would not be irritated by the artificial eye, but, having been penetrated either by an ulcer or a wound, bits of the iris tissue are exposed in the scar so as to become not only a source of irritation, but possibly of deep-seated and dangerous infection. In the third class, the eyeball may be quite natural-looking, but on account of its disordered nutrition, either from glaucoma or from some other cause which impairs the vitality of the corneal epithelium, it is subject to frequent attacks of corneal ulceration which render the ball a nuisance. In all of these cases I have been accustomed for the last six years to cover the cornea either with a conjunctival flap, a Thiersch flap, or an epithelial lip flap. Where, as in the majority of cases, conjunctiva is used, the membrane is *excised* around the lower half of the cornea for an area about $\frac{3}{16}$ of an inch wide at the sides, and $\frac{1}{8}$ inch below. Above this zone the membrane is dissected free from the globe as far as the upper fornix, in

the neighborhood of which a cross cut is made through the membrane to allow it to be slid down over the cornea without putting too much tension on it. Three sutures below are generally sufficient, but these should be put well into the episcleral tissue, nearly as deeply as in the advancement of one of the straight muscles. It may be asked why not accomplish the same thing by dissecting up the conjunctiva both above and below and sewing it together in a straight line across the centre of the cornea. This is the method which first occurred to me and which I tried without success both on men and on rabbits. It proved to be practically impossible to bring enough raw surface from each side into contact to produce a firm union. As soon as the stitches came out, the conjunctiva slipped gradually back leaving the cornea nearly as much exposed as before. This is the reason for putting the stitches into the episcleral tissue after denuding the sclera below the cornea. Unless this is done, the tension on the upper flap is apt to pull up the conjunctiva from below, so that the line of sutures lies across the cornea and firm union does not take place.

Where, from any cause, the conjunctiva is atrophic and the space for an artificial eye would be too much limited by the operation just described, I use an epithelial lip flap (*i. e.*, a thin flap shaved from the lip with a razor; or a Thiersch flap. The conjunctiva having been dissected up for $\frac{1}{8}$ of an inch around the cornea, and the cornea having been scraped (especial care being taken in the neighborhood of the limbus), the flap is spread out carefully over the cornea and tucked under the loose conjunctiva on all sides. It is well to bandage both eyes for twenty-four hours after these operations. I have used the Thiersch flap for this purpose only once, because, although it healed on perfectly, the accumulation of dead epidermis on its surface caused some irritation and I scraped the skin flap off and substituted a lip flap for it. I think, however, that the irritation could have been avoided if the patient had wiped off the dead epidermis once or twice a week (as I have since learned to teach other patients to do, where Thiersch flaps have been substituted for con-

junctiva in other sorts of operations); and the ease with which larger Thiersch flaps can be obtained, inclines me to give them another trial where a nearly full-sized cornea requires to be covered.

It should not be understood that I propose these operations as substitutes for evisceration or enucleation in actively infected globes. But in the rather large class of cases in which the patient comes to the oculist with a perfectly quiet stump over which a shell cannot be worn on account of the irritation of the cornea; or on account of the danger of irritating and infecting exposed bits of iris tissue; or where the stump is irritable solely from the degeneration of the corneal epithelium, one or the other of these operations does excellent service in doing away with the necessity for a more radical operation and in preserving the best kind of support for an artificial eye. Moreover, it is readily accepted by some patients who will not consent to an evisceration or an enucleation.

A CASE OF TUMOR OF OPTIC-NERVE SHEATH REMOVED BY KRÖNLEIN'S METHOD, WITH PRESERVATION OF THE EYE AND GOOD VISION.

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(*With illustrations on Text-plate* I.)

The patient, Daniel D., aged thirteen, was sent to me by Drs. Mason and Lees on September 9, 1901.

History.—For last six or eight months the parents have observed the left eye to be gradually becoming more and more prominent; no pain or inflammation at any time; no history of injury or any severe illness.

Examination.—Left eye pushed directly forward to extent of $\frac{3}{8}$ inch; no impairment of movement, no diplopia; pupil normal; tension normal, V = $\frac{5}{12}$; moderate optic neuritis; indistinct feeling of resistance on pressure in lower outer angle of orbit. Upper lid drooped slightly (due to trachoma). Right eye and vision normal. Patient is a healthy-looking country lad, and examination fails to reveal any trace of disease elsewhere.

Diagnosis.—Retro-ocular tumor, situated within the muscular cone, pressing in, but not directly invading the optic nerve.

I admitted the patient into Prince Alfred Hospital, and the following day (September 10th), after consultation with my colleague, Dr. Hughes, who agreed with me as to diagnosis, and propriety of proposed operation, I removed the growth by Krönlein's method.

In cutting through the bone, I found a small circular saw, mounted on a dental engine, a most useful adjunct to the chisel. It was not necessary to divide the external rectus muscle. The

growth was found to be attached to the outer side of the optic nerve, along about half or three quarters of an inch of its length. It was stripped off the nerve without difficulty, the wedge of bone with its soft coverings replaced, and the skin wound sutured with horse hair.

The operation presented no difficulties, and, thanks to the circular saw, only occupied thirty-five minutes from beginning to end. Compared with the usual method of trying to get access from the front, and working in a narrow pocket continually filling with blood, the advantages of Krönlein's operation are enormous and obvious. In this case under any other method it would have been necessary to sacrifice the eye.

The eye went back to its place immediately. There was some slight œdema of lids for a few days. The wound united by first intention, and stitches were removed on fourth day. I showed the patient at the usual monthly meeting of the local branch of the British Medical Association, seventeen days after the operation. The eye was then quite in normal position, and the only external evidence of anything being wrong was the linear skin scar. (See Text-plate I.) In extreme outward movements of the eye there was diplopia (as it, A. Knapp says, always occurs), but it was only elicited on testing with colored glass and flame. Practically in all ordinary uses of the eyes there was no diplopia. The neuritis had quite subsided, and V was $\frac{5}{12}$ — as before operation.

The growth was examined by Dr. George Rennie, honorary pathologist, and Dr. Cleland, resident pathologist, at the Prince Alfred Hospital. They report it to be a completely encapsuled growth, spherical in form, measuring about $\frac{3}{4}$ inch in diameter, and on section showing hemorrhages. Microscopically it presents the characters of a round-celled sarcoma of an aberrant form. They deem it probably non-malignant, and not likely to recur.

Remarks.—Tumors of the optic nerve or its sheath are so extraordinarily rare that any case is worth recording, and successful removal, without sacrificing the globe, is rarer still. In the last volume of the *Transactions of the Ophthalmological Society of the United Kingdom*, Treacher Collins and Devereux Marshall state that during the last fifteen years only two have been removed at Moorfields Hospital out of 388,000 patients treated; and in the whole of the Society's *Transactions*, extending over twenty years, only

five cases have been recorded. In all of these, as in the two recorded in the last volume by Treacher Collins and Devereux Marshall, the eye had to be excised.

Krönlein's operation appears to give us a method of reaching orbital growth, and so saving eyes that would otherwise be lost, and the operation seems to be becoming better known and more frequently performed within the last few years.

Schlodtmann (quoted in the March, 1900, number of these ARCHIVES) records up till then twenty-six cases in which Krönlein's operation had been performed, five of these being for tumors of the optic nerve.

The *Ophthalmic Review* of January, 1901, gives forty-five as the total number of recorded cases of the operation for all forms of orbital growth, including ten for tumors of the optic nerve, and two for tumors of its sheath. (The operation had never been done in Britain.) It would appear, therefore, as if the operation were becoming better known and more frequently performed, although the opportunities for it are few and far between.

As to the likelihood of a recurrence in my patient's case, time alone will show, and I am arranging to have the case watched in his home, to which he has returned. Myxosarcoma is said to be the form of growth most frequently met with in this situation, and these are said to be non-malignant. Deyl and Sattler concur in this, but say that growths originating in the sheath are far more dangerous than those starting in the nerve itself, that they grow more rapidly, and after incomplete removal are followed by rapid and more malignant reappearance.

Illustrating Dr. Pockley's case of endothelioma of the optic nerve removed by Krönlein's method with preservation of sight.

EXOPHTHALMOS AND LOSS OF AN EYE DUE TO A BLOW ON THE TEMPLE, IN A PATIENT WHO WAS THE SUBJECT OF THE HÆMORRHAGIC DIATHESIS.

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BY way of introduction, it may be said that the case here recorded is unique, that it contains a good lesson, and —fortunately—is a rare case. This statement will be plain to one who reads the history.

The case was treated at the New York Eye and Ear Infirmary on the service of Dr. Seabrook; to Dr. Seabrook I am indebted for the privilege of reporting it. No especial effort has been made to find reports in the literature of similar cases.

August 19th.—A. B., male, age twenty-eight. Admitted to the hospital because of inflammatory symptoms in the anterior portion of the right eyeball, resulting from exophthalmos. Patient states that about one month ago a man hit him on the right temple with his fist, and that the eye has been prominent since then. *St. Pr.*—O. D. Lids swollen and œdematous, considerable degree of exophthalmos, slight double injection, cornea slightly hazy in upper, inner quadrant, A. C. normal, iris normal, fundus normal. Complains of slight pain in the eye. V. 20/70. The patient put to bed, atropine used, and the cornea protected by a moist covering.

August 21st.—Condition same. Continue treatment.

August 24th.—Exophthalmos the same, cornea more hazy. For the purpose of exploring, and with the hope of relieving the exophthalmos and saving the cornea, an incision was made with the patient under the influence of ether. Conjunctiva divided, external rectus caught between sutures and divided. Orbit back of

globe explored, finding broken-down blood clots. After the exploration, the ends of the external edges of conjunctiva united by sutures, rectus brought together, and a strip of gauze introduced for drainage.

August 25th.—Very slight inflammatory reaction. Exophthalmos increased, cornea more hazy. There has been a great deal of oozing from the wound. Continue bandage and protection for cornea.

August 26th.—Exophthalmos increased and cornea more broken down. In the afternoon the cornea ruptured and lens and vitreous presented. The lids and surrounding tissues are greatly swollen and black.

August 27th.—Condition same. There is great oozing from the wound. Applied tight bandage.

September 8th.—Swelling becoming less.

September 11th.—Less swelling. An incision was made into the globe and partial cleaning out of its contents. In spite of tight bandaging, following this operation there was an alarming hæmorrhage.

September 12th.—The oozing and bleeding has been partially controlled by a very tight bandage. The parts are swollen and ecchymotic; there is hæmorrhage when the bandage is removed.

September 13th.—Oozing continues and a tight bandage is necessary to prevent hæmorrhage.

September 25th.—The conditions have remained the same up to the present; the swelling is possibly subsiding. A tight bandage is necessary to prevent hæmorrhage; this is shown by hæmorrhage taking place whenever the bandage becomes disarranged.

October 1st.—Swelling less, and less tendency to hæmorrhage.

October 9th.—Some swelling of parts remains. No more hæmorrhage. Discharged from hospital.

Commenting on this case, it may be said that nobody suspected that we were dealing in this case with a bleeder, until after the operation of September 11th; and it may be said that had this condition been suspected, the exploration of the orbit made on August 26th would not have been done; although at the time of this operation, the eye was already doomed because of the progressive necrosis of the cornea.

The important lesson to be learned from the case is that

an injury of the temple or forehead in a patient who is a bleeder,[1] may be an accident involving grave consequences to an eye. It is not necessary to call the ophthalmologist's attention to the points taught by this case; it may be said that he can well afford to bear the case in mind if he should find a case of exophthalmos due to a blow. All of us in childhood and other periods of our lives are subject to severe bumps on the forehead and temples. This case indicates that a bleeder should be mighty cautious in avoiding such accidents, and suggests the idea that the subject of hæmophilia should be warned by his physician of the possible results of such an accident.

[1] It is not claimed that this patient was the subject of hereditary hæmophilia, though it is more than probable that he was; the important point of heredity in making such a diagnosis, was not investigated because of the foreign language the man spoke and his unintelligence.

THE OLDER AND NEWER MYDRIATICS, MIOTICS, AND ANÆSTHETICS IN OPHTHALMOLOGY.[1]

By Dr. H. SCHULTZ, Assistant.

Translated from the *Arch. f. Augenhk.*, Bd. XL., by Dr. Ward A. Holden.

IN recent years a number of new mydriatics, miotics, and anæsthetics have been tried and recommended in ophthalmic practice, so that it now seems proper to compare the older and newer agents in order to determine how far the newer are of value and capable of replacing the older, in part or altogether.

Among the **mydriatics, atropine** holds first place, being the oldest and the most useful. It is the alkaloid from the root of *Atropa belladonna*, and the sulphate is used in ½–2 % solution. It is also introduced into the conjunctival sac in salve form or in substance. It paralyzes the sphincter pupillæ and the ciliary muscle, causing mydriasis and paralysis of accommodation. It is concluded, from the fact that atropine increases the mydriasis caused by paralysis of the oculomotor nerve, that it acts on the sympathetic,—the dilator pupillæ also. Its effect is evident in ten to fifteen minutes, and usually reaches its maximum in fifteen to twenty minutes. The pupil is then dilated almost *ad maximum*, reaction abolished, and accommodation paralyzed. The effect gradually passes off after the third day, to cease altogether in six to eight, or occasionally ten, days. In the newborn and the aged its effect is less energetic. Opinion is divided as to whether it increases or diminishes tension in

[1] From the Royal University Eye Clinic in Berlin.

the normal eye, hence one may conclude that the variations of tension which it can cause in the normal eyes are very slight. In glaucoma, however, it is generally conceded that it increases the tension. If the solution passes through the nasal duct and nose into the pharynx, a sense of dryness is experienced in the throat, hence it is recommended that after the instillation the eye be closed and the tear sac compressed with the finger, or the lid for a time be drawn away from the ball. More serious symptoms of poisoning are rare in adults, but not infrequent in children. The continued use of atropine frequently brings about a follicular conjunctivitis, which necessitates a discontinuance of the atropine and the employment of astringents. In rare cases there is such an idiosyncrasy against atropine that a single instillation will cause severe conjunctivitis, with marked swelling and redness of the lids and the entire region of the eye. Atropine is the principal remedy in iritis and in all forms of keratitis and scleritis accompanied by hyperæmia of the iris. In glaucomatous conditions it increases tension and therefore is contraindicated. Because of the long duration of its action it is not adapted for diagnostic purposes.

In former days, in case atropine was not well borne, 10 % solutions of extract of belladonna were used. But after other alkaloids of mydriatic action came into use they were preferred.

Daturine, the alkaloid of the seeds of *Datura strammonium*, is isomeric with atropine, according to Ladenburg. Its properties do not differ particularly from those of atropine.

Duboisine is the alkaloid of *Duboisia myoporoides*, which is found in East Australia and New Caledonia. It is used in ½–1 % solutions of the hydrochlorate, and acts on the sphincter and ciliary muscle like atropine. Its action is somewhat more rapid and two to three times as strong, but more transient than that of atropine. Its effect is evident on an average of seven to eight minutes after the instillation, reaches its maximum in twenty-five to thirty minutes, and lasts about five days. It irritates the conjunctiva less than atropine, but its general toxicity is greater, and it must

be used with more caution, and not at all in children. If used in place of atropine the solution should not be stronger than $\frac{1}{2}$ %, and the patient should be kept under observation for a time.

Hyoscyamine, the alkaloid of *Hyoscyamus niger*, is identical with duboisine.

From the apomorphous hyoscyamine, hyoscine is obtained. It is used in the form of the hydroiodate in $\frac{1}{12}$–$\frac{1}{2}$ % solution, and acts ten times as energetically as atropine upon the pupil and accommodation. The effect begins sooner than that of atropine, and yet lasts five to seven days. Its long-continued use is better borne by the conjunctiva than is atropine, but it is much more poisonous than the latter and must be used with the greatest care. Michel advises that it be not used at all, on account of its excessive toxic quality.

Recently **scopolamine,** prepared by Schmidt, is coming more and more into use. It is the alkaloid of *Scopolia atropoïdes*, and the hydrochlorate or hydrobromate is used in $\frac{1}{10}$–$\frac{1}{4}$ % solution. It acts quicker and five times as energetically as atropine. Thus a $\frac{1}{5}$ % solution has about the effect of a 1 % solution of atropine. Its effect begins in about twenty-five minutes and lasts four to seven days. According to Merk and Ladenburg, scopolamine and hyoscine are identical, but Peters regards hyoscine as nothing more nor less than an unpurified scopolamine. Raehlmann asserts, on the other hand, that scopolamine $\frac{1}{4}$ % produces a mydriasis similar to that produced by hyoscine, but without the unpleasant after-effects of the latter, and, furthermore, it does not increase intraocular tension. These observations are confirmed by our experiences in this clinic, where $\frac{1}{4}$ % solution of scopolamine has frequently been used in place of atropine without producing unpleasant or dangerous symptoms of intoxication. It is still questionable whether it does not increase tension and whether it can be used with impunity in glaucoma. In this clinic, if atropine irritates and has not sufficient effect, hydrobromate of scopolamine is used in $\frac{1}{4}$ % solution. This solution is less irritating than atropine and is less likely to produce general

toxic effects than either duboisine or hyoscine. But, as Illig states, there is no reason for replacing atropine by scopolamine generally, and the former has the advantage of more lasting effect. Solutions stronger than ¼ % are not to be used, since they may have a toxic effect.

A mydriatic similar to scopolamine is **atroscine**, the difference lying in their aqueous constituents and their optical properties. Koenigshoffer and Hesse found that in ⅛ % solution it was more active than scopolamine. Meyer found only a more intense mydriatic effect, but noticed frequently slight toxic symptoms and a lack of cycloplegic action.

Another group of mydriatics are of much shorter action. The chief of these is **homatropine** synthetically produced first by Ladenburg. A 1 % solution of the hydrobromate is usually employed, causing mydriasis and paralysis of accommodation. The effect is evident in twelve to fifteen minutes, reaches its maximum in forty minutes, and passes off in eight to ten hours or at the most one day. It is less toxic than atropine, and unpleasant effects are not observed. In the newborn and in the old its effect is less marked. It increases tension and is contraindicated in glaucoma.

A less familiar mydriatic is **gelsemine**, the alkaloid of *Gelsemium sempervirens*, which, according to Moritz, produces a mydriasis lasting twelve to seventeen hours.

Another unfamiliar and little used mydriatic of brief action is **ephedrine**, obtained by Nagai from *Ephedra vulgaris*. Miura found that a 10 % solution produced in forty to sixty minutes a moderate mydriasis with preserved reaction to light, which lasted from five to twenty hours. The accommodation was scarcely affected. Groenouw found its action more prompt and of shorter duration.

Geppert proposed a mixture of ephedrine and homatropine which he called **mydrine**: thus, of hydrobromate of homatropine 0.01, hydrochlorate of ephedrine 1.00, and water 10.00. Groenouw tried this in his own eyes and found that it had a more energetic action than ephedrine without lasting so long and paralyzing the accommodation like homatropine. Our experiments showed that the pupil begins to dilate in ten to twelve minutes, and reaches its maximum dilatation in thirty

to forty-five minutes. The accommodation is slightly affected. The effects begin to pass off in an hour and a half and are over in six or seven hours. We regard this agent, therefore, as much superior to homatropine for diagnostic mydriasis and much less disagreeable for the patient. In consequence of its high price and the necessity of using a 10 % solution the agent is rather dear.

A new synthetic mydriatic of brief effect is hydrochlorate of **euphthalmine.** Treutler found that a 5 % solution produced mydriasis in ten to fifteen minutes, reaching a maximum in sixty to eighty minutes. The reaction to light is abolished and the accommodation is paralyzed, but less than by homatropine. The effect passes off in four to five hours. We found that the mydriasis began in fifteen minutes, reached its maximum in fifty to seventy minutes, and passed off in six to seven hours. The accommodation was slightly affected, and the subjective unpleasant effects lasted at the most three hours.

According to Schneider, tension is not increased.[1] Euphthalmine has as great mydriatic effect as homatropine, while it affects the accommodation less and is more transient. It produces greater mydriasis than mydrin, and the effects of the two are of about equal duration. With mydrin it has the advantage over cocaine of not affecting the corneal epithelium. We consider it, therefore, a good mydriatic for diagnostic purposes and it is cheaper than mydrin.

Mydrol, iodomethyl-phenylpyrazol, is a new mydriatic which has been described by Cattanes. In 5–10 % solutions it produces a moderate mydriasis lasting some hours, the accommodation being but slightly affected. It causes a marked contraction of the conjunctival vessels. We have had no personal experience with it.

The first **miotic** used was the **extract of the Calabar bean,** *Physostigma venenosum.* In ½ % solution it causes miosis lasting about six hours.

As soon as it became possible to obtain the pure alkaloid, **physostigmine** or eserine, this was used exclusively in

[1] Dr. Knapp has recently reported one case of an acute attack of increased tension from its use.

place of the extract. A ½–1 % solution of the salicylate or sulphate is used, the former being less irritating. It produces a contraction of the sphincter and ciliary muscle and the eye becomes myopic, both the near point and the far point being brought nearer the eye. The tension is at first increased and then becomes markedly lowered. The effect begins in from one to one and a half minutes, and is complete in thirty to forty minutes. The pupil then is of pinhead size. The effect diminishes after an hour, but is abolished only after twenty-four to thirty-six hours, or, it may be, several days. The spasm of accommodation is frequently accompanied by unpleasant drawing pains which after frequent instillations may increase to actual supraorbital neuralgia. Symptoms of intoxication come on only after frequent use of the drug, and consist in headache, giddiness, and vomiting. It is used chiefly in glaucoma, in which it often produces excellent but transient results, although Cohn claims to have cured acute as well as chronic glaucoma with eserine alone. In this clinic a drop of a ½ % solution is instilled two or three times a day in the beginning of mild attacks of glaucoma, while in repeated attacks or in severe ones iridectomy is done, for, according to Schweigger, "a few days' time may be gained with eserine, but as a rule the result is that time is lost."

Silex and others contend, in opposition to Cohn, that continued treatment of glaucoma with eserine is unadvisable, since almost always iridectomy must be done later, and then the prognosis is worse. Eserine is used also in cases of peripheric ulcer of the cornea with perforation threatening, in fresh prolapses of the iris, in keratocele and keratoconus. When used for a long time it may lead to iritis with posterior synechiæ, especially when the iris is hyperæmic. When exposed to the air and light it assumes a red color without losing its efficacy. According to Hallauer the salicylate keeps better than the sulphate.

Pilocarpine, the alkaloid of folia jaborandi, is a weaker miotic which contracts the pupil and the ciliary muscle and reduces tension like eserine. The muriate is used in 1–5 % solution. The beginning and the duration of its effect are

like those of eserine, but the miosis and spasm of accommodation are not so marked. It is not so likely to cause iritis, and is less likely than eserine to produce unpleasant toxic effects.

A miotic recently studied is **arecaline,** the alkaloid of the areca nut, obtained in the form of a hydrobromate by Merk in 1894. Lavagna found that when instilled it caused some lachrymation and blepharospasm. One drop of a 1 % solution caused in two minutes a contraction of the pupil which reached its maximum in ten minutes and remained there thirty minutes, passing off altogether in one and a half hours. There were no unpleasant effects even when it was instilled repeatedly. Recently Bietti has reported on the drug. He found that in normal and in glaucomatous eyes it acted as a a miotic more quickly and energetically than eserine but the duration of its action was much shorter. He, therefore, believes that it will be of practical value only in those attacks of glaucoma in which eserine does not contract the pupil.

Muscarine and **pelletierine** also cause miosis, but are not used in ophthalmology.

Of the **anæsthetics** the first to be mentioned is **cocaine** introduced into ophthalmology by Koller in 1884. It is the alkaloid of the leaves of the coca plant and is used in 2–5 % solution of the hydrochlorate. Since it should not be sterilized by boiling, it thus being decomposed into benzoylecgonin and methyl alcohol, losing its anæsthetic effect and becoming irritating, it is best prepared in a 1:10,000 bichloride solution to keep it free from micro-organisms. In two or three minutes after instillation it produces complete anæsthesia of the cornea and conjunctiva lasting ten to twenty minutes. On the deeper parts, such as the iris, its effect is not certain. It constricts the vessels and thus causes anæmia and diminution of secretion, as well as a widening of the palpebral aperture through excitation of the unstriped fibres of Müller's muscle and through abolition of the reflexes of the orbicularis. After five to twenty minutes mydriasis begins, due to excitation of the sympathetic, and passes off in from six to twenty hours. Mydriasis is not complete and the response to light is not lost. The accom-

modation is moderately affected for a few hours, but there is never complete paralysis. Cocaine in 2 to 4 % is much used as a mydriatic for diagnostic purposes, but its effect upon the pupils is not very great and often is unequal, and in inflamed eyes the effect is uncertain. Therefore atropine or homatropine is usually combined with it, for while either of these alone produces mydriasis the dilatation is much wider when cocaine is used as well. In this clinic the combination with homatropine is used regularly. In the inflamed eye cocaine has less effect and sometimes produces no anæsthesia at all. The anæsthetic effect is due to an excitation of the vaso-constrictors under the control of the sympathetic and to a direct action upon the terminations of the nerves. At times cocaine causes a well-marked hypotony in normal eyes, which in cataract extraction may be very unpleasant. In glaucomatous eyes its mydriatic effect has been supposed to increase the tension, Manz and others having reported cases in which the instillation of a few drops brought on an acute attack of glaucoma. Groenouw claims, on the contrary, that cocaine may be of considerable benefit in glaucoma, and particularly in cases in which eserine does not produce the desired effect. Hence one must conclude that the tendency to increase the tension is exhibited in but a small number of eyes predisposed to glaucoma. In this clinic glaucoma has never been seen to follow the use of cocaine and cocaine has been used in cases of glaucoma.

The chief disadvantage of cocaine, which is the most useful anæsthetic, is the drying and casting off of the corneal epithelium which it causes. This may be prevented by keeping the eye closed after the instillation. For the most part regeneration of the epithelium takes place very quickly, but permanent opacity of the cornea has been noted several times. According to Hirschberg the latter was due to the excessive use of bichloride. General toxic symptoms rarely follow instillation but are frequent after subcutaneous injection. The maximum dose for subcutaneous injection should be 0.05, but even this amount may be followed by unpleasant symptoms. Abadie reported disturbances of

equilibrium, fainting, and death after the subconjunctival injection of 0.04 in a woman of seventy-one. Rogmann observed a fainting fit lasting eight hours after the injection of 0.04 into the lid. In this clinic when extensive lid operations are to be done, ether anæsthesia is regarded as less dangerous than the subcutaneous injection of cocaine, there being no means of determining that a patient has an idiosyncrasy against the drug. Mellinger claimed that in consequence of its vaso-constrictor properties cocaine delayed the first union of corneal wounds. The mydriatic and cycloplegic effects are undesirable when one wishes, for example, to remove a foreign body. The wide pupil is disturbing both in iridectomy and in cataract operation, since in the former it facilitates prolapse and in the latter renders the section difficult.

Thus cocaine has many disadvantages and it is desirable to find a satisfactory substitute. Since 1884 many anæsthetics have been tried in the eye but few of them rival cocaine.

Apomorphine 2 %, according to Bergmeister, produces anæsthesia of the cornea and conjunctiva in ten minutes, but it also causes opacity of the cornea and other unpleasant symptoms.

Köenigstein found that 10% **chloral hydrate** produced anæsthesia, but was very irritating.

Benzoltropin, according to Filehne, produces marked anæsthesia but also unpleasant casual symptoms like those of atropine.

Stenocarpine, obtained from a variety of acacia, produces anæsthesia of the cornea and conjunctiva lasting for thirty minutes, when used in 2% solution, as Chevallereau found. It has the disadvantage of producing mydriasis and cycloplegia lasting two or three days.

Toad poison, a 1% solution of the dried liquid from the skin, produces, according to Staderini, in thirty minutes complete anæsthesia of the cornea and conjunctiva, without irritating and without injuring the cornea, although the anæsthesia lasts five hours (?).

Strophantine was found by Panas to be an anæsthetic but

a very irritating one, while **quabaïn** has no anæsthetic properties.

Erytrophleine hydrochlorate, according to Schmidt-Rimpler, is in ¼ % solution an irritating and slowly acting anæsthetic.

In 1891, **tropacocaïne** was introduced as a substitute for cocaine. It was first obtained by Giesel from coca leaves, and later prepared synthetically by Merk. Chemically it is benzolpseudo-tropeïn. It is used in a 3 % solution of the hydrochlorate in 0.6 % salt solution, the latter preventing irritation. According to the investigations of Chadburne, Schweigger and Silex, Ferdinando, Vamossy, Rogmann, and others, it causes, when instilled, a slight transient burning, and has a quicker, more intense, and more durable anæsthetic action than cocaine. The anæsthesia begins in one and one-half minutes and lasts twenty minutes. It causes no anæmia, dilates the pupil but slightly if at all, and affects the accommodation as little. It keeps well, is not half so toxic as cocaine, and has no injurious effect upon the cornea. Rogmann found it rather more painful when injected subconjunctivally than cocaine or other anæsthetics, but in about four hundred cases he saw no toxic symptoms, whatever its mode of application.

Our own experiments with the 3 % solution showed that it produced complete anæsthesia of the cornea in one and one-half to two minutes, caused less burning than cocaine, and had no unpleasant effects, it thus having decided advantages over cocaine. In this clinic it has been used for several years. To anæsthetize the iris in cataract extraction it is instilled into the anterior chamber with a pipette slightly curved at its point. Two instillations at an interval of three minutes anæsthetizes the iris (Schweigger), without producing symptoms of intoxication. The price of the drug is still high, but recently it has been falling.

In 1896, a further substitute for cocaine, **eucaïne** was prepared by the chemische Fabrik auf Actien in Berlin and recommended by Vinci. It occurs in two forms, A and B, the former being irritating on account of the methyl alcohol contained in it. The latter has been reported on favorably

by Vinci, Berger, Deneffe, Silex, and others. A 2% solution of the hydrochlorate is used. This produces anæsthesia of the cornea in two to five minutes, lasting ten to twenty minutes. Its effect is upon the nerve endings. When instilled it causes more burning than cocaine and often produces hyperæmia of the conjunctiva. The pupil, accommodation, and tension are not affected. It is less toxic and more permanent than cocaine and may be sterilized by boiling. Solutions stronger than 2% are too irritating to be used. Views differ in regard to its toxic properties.

Our experiments showed that eucaïne B in 2% solution acted as quickly and completely as cocaine but that it caused more burning and injection. In inflamed eyes it seems contraindicated, and on the whole it is not so good as tropacocaïne or holocaïne.

Holocaïne was prepared in 1897 by Tauber. The hydrochlorate is used in 1% solution. Hirschberg first used it in ophthalmology. Detailed experiments were made by Heinz and Schlösser. One to two drops of a 1% solution produce in one-half to one minute a complete anæsthesia of the cornea and conjunctiva from direct action upon the sensory nerves, without any ischæmia. The anæsthesia lasts ten to fifteen minutes or more. It causes but little burning and does not affect the pupil, accommodation, or tension. The corneal epithelium is not much affected but the drug has greater toxic properties than cocaine. A 1% solution is powerfully antiseptic, but it can be sterilized by boiling. Kuthe, Guttmann, Deneffe, Berger, and others report favorably upon it. On account of its antiseptic properties Hasket Derby has used it in corneal ulcers, and the effect apparently was good. Chevallier and Hinshelwood claim that solutions lose their efficacy in two weeks, while Tauber believes that the solutions are very permanent. The alkali in glass bottles sometimes produces a deposit in the solution but this can be filtered off or it may be prevented by boiling the solution in a porcelain dish.

In this clinic holocaïne has been used extensively since 1897 in place of cocaine, with good results. A 1% solution produces complete anæsthesia in one-half to one and one-

half minutes, and this lasts for ten or fifteen minutes. A transient injection may be noticed immediately after the instillation. No toxic or other unpleasant effects were observed, and the cornea was affected but rarely. In inflamed eyes it, like other anæsthetics, often fails.

Vamossy made experiments on animals with a new anæsthetic, **anæsine.** A 10% solution corresponded to a 2½% solution of cocaine, and produced anæsthesia of considerable duration. It did not irritate, was not toxic, and did not decompose. Experiments on man have not yet been reported.

The aqueous extract of **suprarenal capsule** has been much used and commended in the last few years as an astringent and anæsthetic. Bates experimented with the suprarenal capsule of the sheep. When instilled it constricts the conjunctival vessels, producing ischæmia. This took place in all inflammatory conditions of the anterior portion of the eyeball. The effect lasts an hour. It checks the flow of blood in operations. Kyle recommended the aqueous extract as an astringent and anæsthetic, the latter when combined with cocaine. It constricts the vessels of the normal and inflamed conjunctiva. He used it in conjunctivitis, keratitis, and iritis without unpleasant effects. Mullen used the Armour extract with cocaine for squint and pterygium operations. Later Timafejeff made careful investigations and found that with medium and strong solutions the conjunctival vessels are constricted for ten to forty-five minutes, but the deeper parts are not affected. In inflamed eyes the effect was transient and insufficient. Saturated solutions caused marked burning. It has no anæsthetic effect but hastens and facilitates cocaine anæsthesia. It is indicated only in simple conjunctivitis, to hasten cocaine anæsthesia, and for cosmetic purposes.

In conclusion it should be mentioned that Panas strongly recommended the use of oily instead of aqueous solutions of these drugs, olive oil being used. Scrini finds some advantages in vaselin oil.

THE CYCLOPLEGIC AND MYDRIATIC ACTIONS OF ATROSCINE AND I-SCOPOLAMINE.

By Dr. WALTER F. MACKLIN, New York.

SCOPOLAMINE was the name given to the crystallized alkaloid first obtained from *Scopola carniolica*. It is official in the German Pharmacopœia as a hydrobromide, scopolaminum hydrobromicum. Atroscine, according to Hesse,[1] is a pure crystalline base, existing in commercial scopolamine, in what was originally termed hyoscine. The i-scopolamine of Schmidt and Gadamer is crystalline, and is believed to be identical with the atroscine obtained by Hesse.[1] Both atroscine and scopolamine have been constituents, as hydrobromides, of commercial hyoscine hydrobromide, but they have been contaminated by another base, now termed hyoscine, which is a syrupy liquid.

There is little or no difference in the action of atroscine and i-scopolamine, which fact supports the statement of Dr. Hesse, that they are identical in nature.[1] When used in a one per cent. solution (preferably in castor oil), they act as rapid and powerful mydriatics, and, as cycloplegics, are as potent and reliable as atropine sulphate, while the power of accommodation returns in five days. Of course, with homatropine this power returns in twenty-four hours, which is undoubtedly a great advantage in many cases, yet homatropine has disadvantages which must be apparent to all who use it, notably the fact that it never does completely overcome accommodation, but leaves it in an uncertain and indefinite condition of unstable equilibrium—at one moment

[1] From personal letter from Dr. Hesse to my friend, Wm. Martindale, Esq., the eminent London chemist.

giving one result and later quite a different one—always leaving an element of doubt as to whether a correct conclusion has been arrived at or not. Such doubt never exists after the use of atroscine or i-scopolamine.

In order to show clearly and graphically the action of these drugs, I have arranged in tables the results of my experiments, conducted in the Moorfields Eye Hospital, London, in Mr. Lang's service. The pupils are measured by the pupilometer, and are represented in millimetres, while the accommodation is measured by the hair optometer, the results being given in dioptries. As soon as the accommodation has been reduced to four dioptries, a plus four diopter lens is placed in front of the observed eye, in order to bring the punctum proximum nearer, thus avoiding the error of mistaking the inability to see the hair at a great distance for absence of the accommodative power. The results are then always corrected before being noted. The observations are made at intervals of five minutes.

TABLE FOR 1 % ATROSCINE IN CASTOR OIL.

	Case 1.		Case 2.		Case 3.		Case 4.		Case 5.		Case 6.		Case 7.	
	D.	P.	D.	P.	D.	P.	D.	P.	D.	P.	D.	P.	D.	P.
	9.	3.	10.	3.5	7.5	2.5	8.	2.5	8.25	4.	10.	3.	10.	3
5 minutes...	9.	3.	10.	3.5	7 5	2.5	8.	2.5	8.25	4.	10.	3.	10.	3.
10 " ...	8.5	4.	6.5	4.5	3.5	4.	6.5	4.5	8.	6.	8.	4.5	8.	4.5
15 " ...	8.5	6.5	4.5	8.	2.5	6.	5.5	6.5	6.5	8.	7.5	9.	5.5	6.
20 " ...	7.5	6.5	3.5	9.	1.5	8.	3.25	8.	4.	9.	5.	9.	3.	8.5
25 " ...	7.	8.	3.	9.	.5	8.	2.	8.	2.	9.	3.	9.	3.	8.5
30 " ...	6.	8.	3.	9.	.5	8.	1.5	8.	1.5	9.	2.5	9.	2.5	8.5
35 " ...	2.5	8.	2.	9.	.5	8.	1.	8.	.5	9.	1.5	9.	2.	8.5
40 " ...	1.5	8.	1.5	9.	0	8.	.5	8.	.5	9.	.5	9.	1.5	8.5
45 " ...	.5	8.	0	9.	.....		.5	8.	.5	9.	0	9.	1.	8.5
50 " ...	0	8.	.....		.....		0	8.	0	9.	.....		.75	8.5
55 " ...	.....		.....		.....		.....		.....		.....		.75	8.5
60 " ...	.....		.....		.....		.....		.....		.....		.50	8.5
65 " ...	.....		.....		.....		.....		.....		.....		0	8.5
24 hours.....	?	?	.5	9.	?	?	?	?	?	?	?	?	?	?
48 "	?	?	?	?	?	?	2.5	7.	?	?	?	?	?	?
3 days.....	6.	6.	5.5	7.	?	?	?	?	4.5	6.5	?	?	6.	7.
4 "	?	?	?	?	7.5	4.	?	?	?	?	?	?	?	?
5 "	9.	4.5	10.	5.	.....		8.	4.	8.25	4.5	10.	5.5	10.	5.

D = Dioptries of accommodation.
P = Pupil—measured in *mm*.
? Patient did not return.

TABLE FOR 1 % I-SCOPOLAMINE IN CASTOR OIL.

	Case 8.		Case 9.		Case 10.		Case 11.		Case 12.		Case 13.		Case 14.	
	D.	P.	D.	P.	D.	P.	D.	P.	D.	P.	D.	P.	D.	P.
	9.	3.	10.	3.5	13.	3.5	7.	3.	8.	2.5	8.25	4.	10.	3.
5 minutes...	9.	3.	10.	3.5	13.	3.5	7.	3.	8.	2.5	8.25	4.	10.	3.
10 " ...	8.5	4.	4.	5.	10.5	4.	3.5	4.5	7.	4.5	8.	6.5	10.	4.
15 " ...	7.5	6.5	3.	8.	7.	5.	3.5	7.	6.	7.	4.5	8.5	9.	8.5
20 " ...	7.	7.5	2.5	9.	4.5	7.	2.5	8.	4.5	8.	3.	9.	4.5	9.
25 " ...	6.	8.	1.5	9.	2.	9.	2.	8.	3.5	8.	2.	9.	3.	9.
30 " ...	3.5	8.	1.5	9.	1.5	9.	2.	8.	3.	8.	1.5	9.	1.5	9.
35 " ...	2.5	8.	.5	9.	1.	9.	2.	8.	1.5	8.	.5	9.	.5	9.
40 " ...	2.	8.	0	9.	.5	9.	.75	8.	.5	8.	.5	9.	.25	9.
45 " ...	1.	8.	.....		0	9.	0	8.	.5	8.	0	9.	0	9.
50 " ...	0	8.	.....		.....		.....		0	8.	.....		.....	
24 hours.....	?	?	.5	9.	?	?	?	?	?	?	?	?	?	?
48 "	?	?	?	?	?	?	?	?	2.5	7.	?	?	?	?
3 days.....	5.5	6.5	5.5	7.	?	?	?	?	?	?	4.5	6.5	?	?
4 "	?	?	?	?	8.5	5.	7.	4.	?	?	?	?	?	?
5 "	9.	4.5	10.	4.5	?	?	.....		8.	4.	8.25	4.5	10.	5.5

D = Dioptries of accommodation.
P = Pupil—measured in *mm*.
? Patient did not return.

To apply, dip a glass rod into the oily solution, allow the surplus to drain off, and then lightly touch the conjunctiva of the lower lid. In this way but little oil is used and no difficulty will be experienced in making the subsequent retinoscopy.

The advantages of the oily solution are:

1. Only one application is required.

2. More rapid and certain action of the drug.

The tables show that:

1. Mydriasis begins in ten minutes and is complete in twenty.

2. Cycloplegia begins in ten minutes and is complete in about fifty (average).

3. The power of accommodation returns to normal in five days (with occasional slight variations).

These drugs have never failed to give me satisfactory results, and I believe they ought *always* to be used in preference to homatropine in school children and all other persons with active accommodation, who can possibly afford the necessary five days' time.

A CASE OF LEUCO-SARCOMA OF THE CHOROID.

By ALBERT B. McKEE, M.D., San Francisco, Cal.

(*With two illustrations on text-plate II.*)

On *April 28th*, I was consulted by W. D., aged about thirty-eight years, who had noticed a slight failure of sight. Six months previous, he had gotten some dust in the eyes and attributed the failure of sight to some injury sustained at that time. He has noticed that the vision of the left eye is better peripherally than in the centre of the field. The patient has sometimes fancied that there was a slight aching sensation in that eye, but aside from the visual disturbance, there are no other symptoms.

Upon examination, the right eye was found normal in all respects. The vision of the left eye was $\frac{15}{200}$ to $\frac{15}{100}$, the field of vision was somewhat shrunken on the temporal side, there was a relative scotoma in the lower temporal quadrant, and an absolute central scotoma reaching about five degrees in each direction from the fixation point.

The examination of the fundus showed an elevated area beginning near the disc, extending upward and to the nasal side, and shelving gradually from the point of greatest elevation, about five dioptries in height, which lay in the diagonal two-disc diameters from the papilla. The margin nearest the disc was sharply defined. The whole growth was limited above by the vertical diameter and extended downward on the nasal side almost to the horizontal meridian. Its breadth was about four disc diameters. Beyond it, the retina was normal. The surface of the elevated area was paler than that of the surrounding fundus but slightly mottled, and this discoloration was somewhat more marked at the apex. Numerous vessels crossed the tumor but all could be traced to their connections with the main retinal trunks.

The patient was told that the detachment was probably due to a growth, and a consultation was suggested. The consultant, Dr. Pischel, agreed with this view, but it was decided to submit the patient to a course of specific treatment. Owing to the facts that the patient lived at a distance from the city, that he seemed to improve for a time, and that he was caused little inconvenience by the trouble, he was seen at irregular intervals for five months. At times the vision improved greatly, several times reaching $\frac{15}{45}$. The central scotoma likewise diminished.

On *September 20th*, the vision had again fallen to $\frac{15}{200}$, as it had frequently done when the patient had over-used his eyes. The size of the detachment and its elevation had increased somewhat and it overhung the disc by a smooth rounded margin.

Dr. Barkan, who saw the case with me at this time, was strongly of the opinion that the growth was malignant and advised enucleation. The patient's consent having been obtained, the eye was removed.

After freezing the globe, it was incised by Dr. Geo. Brady, and so exact was its localization that the growth was divided almost exactly in its centre.

I wish to express my appreciation of the exhaustive examination and the accurate and artistic preparations and photographs made by Dr. Brady whose report in full is appended.

Pathological Report by Dr. Geo. Brady:

Macroscopic (see Fig. 1): The ball is normal in size, measuring 24 *mm* antero-posteriorly, 24 *mm* horizontally, and 23.5 *mm* vertically. The optic nerve has been divided 4 *mm* behind the sclera, and shows no pathological change. The sclera presents no thinning, discoloration, or protrusion over what is suspected to be the site of the new growth. Cornea, anterior chamber, and iris all appear healthy.

After five days' suspension in a ten-per-cent. aqueous solution of formol, the eyeball was frozen, and divided in a transversely oblique plane slanting upward at an angle of about thirty degrees with the horizontal. As the halves separated, there was revealed in the posterior superior median quadrant of the globe a grayish-white lenticular tumor nodule apparently situated wholly in the choroid, with a sessile base 5 *mm* broad abutting on the sclera. It is in immediate proximity to the nerve head and overhangs the optic disc about 0.75 *mm*. The longest diameter (the vertical) amounts to 9.5 *mm*. An elliptical cross-section near the junction of its middle and lower thirds measured 5 *mm* x 4 *mm* in its respective axes. The cut surface is homogeneous, showing through-

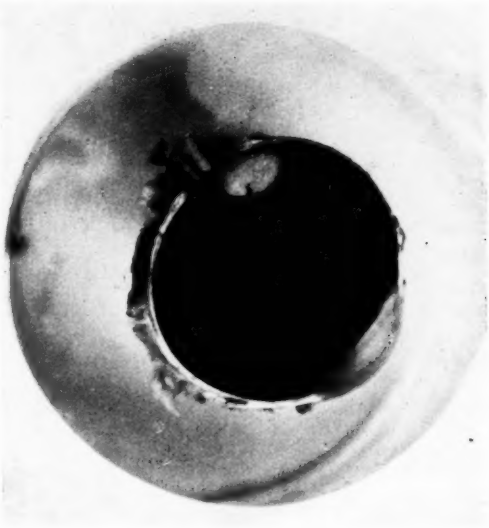

FIG. 1.

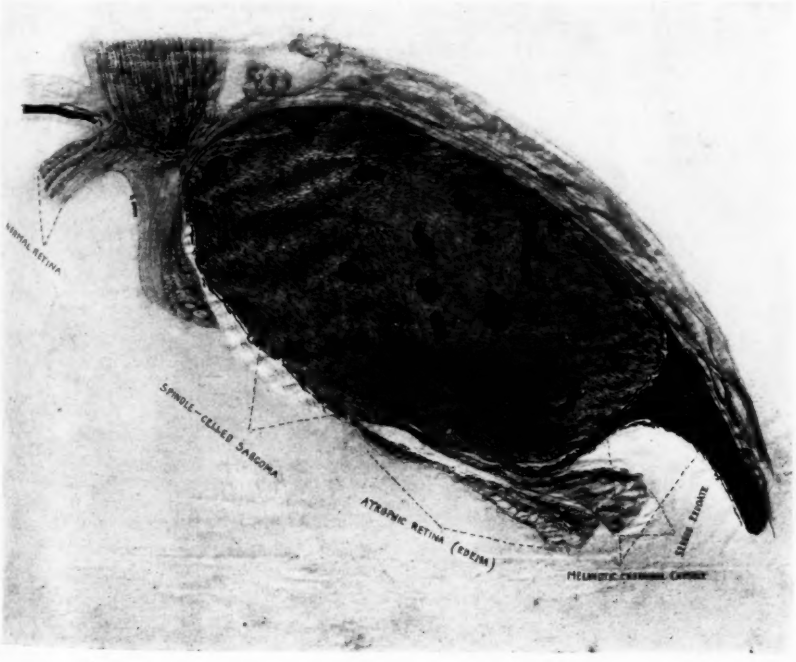

FIG. 2.

Illustrating Dr. McKee's case of leuco-sarcoma of the choroid.

out a consistency touching on the fibrous, and gives the impression that it is probably a fibro-sarcoma.

Nowhere are there to be noticed any hemorrhagic areas or necrotic spots marring the uniform grayish-white tint. No vessels are visible.

Particular attention was directed to ascertaining whether any adventitious vascular twigs invaded the overlying retina; but none was found. The retina seemed closely to invest the subjacent neoplasm everywhere. Its point of highest elevation, corresponding to about the middle of the tumor, is about 5 *mm* distant from the sclera. From here the tent-shaped detachment gradually slopes toward the pole of the new growth, where it regains the normal level. At the very tips of the mass is to be noted a small sub-retinal space about 0.3 *mm* in diameter, filled with clear serous exudation. Over the middle of the nodule the retina seems to be somewhat thinned, being slightly paler than elsewhere.

The retinal vessels leading from the disc are strongly injected. The veins on the nasal side can be traced forward as far as the middle of the neoplastic mass, but are wholly confined to the retina proper. The disc shows slightly exaggerated physiological cupping, but no signs of incipient glaucomatous excavation.

A thin choroidal capsule surrounds the tumor on all sides. Around the entire periphery, but more particularly anteriorly, we see a peculiar irregular pigmentary change and thickening of the choroid. Close up to the growth it is 1.5 *mm* thick and of a dark color. From this point it gradually thins and becomes lighter till at 3 *mm* from the ora serrata it ends abruptly, after having returned to the normal thickness of the choroid. This discolored area lies irregularly concentric to the nodule, varying in distance from the tumor margin from 8 *mm* to 3 *mm*. The vitreous is normal in consistency and transparency. No liquefaction or formation of opacities has yet occurred.

Microscopic (see Fig. 2): All parts of the ball anterior to the ora serrata are normal. The vitreous shows no signs of disease. The surrounding sclera everywhere appears healthy. The optic nerve, when stained with eosine and hematoxylin, as well as by Van Gieson's, Pal's, and Weigert's methods, seems to have suffered little if any change. The new formation seems to spring from the tunica vasculosa of the choroid. Some sections indicate that it probably originated from the layer of large vessels. Its tissue is richly cellular, with hardly any intervening interstitial fibrous tissue. The cells are uniformly fusiform and of medium size. The large central nuclei stain very deeply and are generally oval, although occasionally circular in shape. Karyokineses are relatively infrequent. No bipolar forms indicating rapid proliferation were noticed. The spindle cells arrange themselves in interlacing bundles and parallel whorls which sweep around numerous blood-vessels. Many of the vessels are of large size with no intrinsic wall of their own. All are strongly hyperæmic, but the contained blood has undergone no pathological change. No

cellular infiltration, hemorrhages, necroses, or other degenerations have occurred.

As regards the retina, the nerve-fibre layer seems to be least affected. Throughout the nasal half, it appears slightly œdematous, and where it passes over the tumor, moderate atrophy has set in. The neuro-epithelial layers are markedly changed. The rods and cones have totally disappeared over the entire area of detachment and the outer nuclear and reticular layers have fused into a scanty layer of small round elements, reduced to three or four rows in thickness. Less than one half the usual number of ganglionic cells remain and these are so swollen and distorted as to be scarcely recognizable. Both limiting membranes are intact. In many places we have only the sustentacular fibres of Mueller to bridge over the space between the membranes. The cyst-like spaces so demarcated are filled with a clear serous fluid. Where remnants of the reticular layers still persist these œdematous cysts are traversed by a fine network of very delicate fibrils.

Over the melanotic area of the choroid peripheric to the tumor, the retina regains, in great part, its normal appearance. The temporal half of the retina shows here and there a few cyst-like spaces as above described, but otherwise is uninvolved. There are no discoverable signs of inflammation, recent or chronic, in the retina.

The choroidal capsule around the tumor appears to consist of a thin layer of large round swollen cells filled with yellowish-brown pigment granules. The nuclei are indistinguishable.

Between this capsule and the atrophic retina, lies a small amount of coagulated serum with small scattering masses of granular pigment, similar to that contained in the cells of the capsule.

The thickened, discolored area of the choroid about the neoplasm is seen to consist of a great number of oval cells with large vesicular nuclei intermixed with an enormous number of branching pigment cells resembling those normally present in this membrane. The oval elements are free from pigment. Many hyperæmic vessels of varying size pierce the mass; a small number of branching pigment cells lying in the peripheral layer of the tumo revidently belong to this melanotic patch, as they can be traced along the blood-vessel walls into the dark brown area. The tumor cells proper contain no pigment.

Diagnosis.—Spindle-celled sarcoma of the choroid with atrophy of the retina and melanosis choroideæ.

A CASE OF ACUTE TRAUMATIC GLAUCOMA WITHOUT VISIBLE SIGNS OF THE INJURY.

By Dr. ED. G. RUST, Cleveland, Ohio.

The patient, F. E. S., a prominent business man of this city, thirty-one years of age. Family and personal history negative. His visual acuteness with spectacle correction is $\frac{20}{20}-$. He consulted me January 18, 1901, on account of a condition of his left eye, the result of an injury received by him a few days previous, while a passenger on a crowded street car. The conductor, in the act of ringing up fares, had brought his elbow forcibly in contact with the left lens of the glasses worn by patient, crowding it directly against the eyeball. The eye at once became red and very painful. After a few hours the pain subsided into a dull ache, in and around the ball. The vision became dim, with a well-defined colored halo around a flame of light. On examination I found vision in affected eye $= \frac{20}{30}-$, with correction; slight circumcorneal injection; pupil somewhat dilated and faintly responsive. Some haziness of cornea, but only sufficient to dull the fundus image. Tension +T1. Sulphate of eserine was instilled locally, and sodium salicylate administered internally. Apparent benefit followed the use of these remedies. January 23d, all the symptoms had become suddenly worse; the drug action had proven palliative only. Vision decreased to $\frac{20}{200}$, with or without correction. Pupil dilated and immovable; cornea steamy; fundus undiscernible; tension +T2. The patient consenting to an operation I did an iridectomy, with the incision well into the sclero-corneal tissue. A Graefe knife was used because of the shallow anterior chamber. The decided spurt of the aqueous, and the copious oozing hemorrhage from the iris following the corneal incision, emphasized the intense intraocular pressure. A smooth healing, and an uninterrupted recovery followed.

Tension at once became normal and vision = $\frac{20}{20}$, at end of eight weeks. Over one year has now elapsed and no symptom of disease has occurred either in the operated or in the fellow eye. My personal knowledge that there was no glaucoma existing at or prior to time of injury, and the fact that the eye symptoms began immediately after the injury (the infliction of which was witnessed by several persons), prove traumatism to have been the primary cause. The pathogenesis may have been a swelling of the lens, which blocked the iris angle, or the lens may have been slightly tilted and by pressure have produced sufficient "turgescence of the ciliary processes"[1] to "press against the iris-base and compress the filtration angle."[1] Jackson says of "glaucoma following traumatism," that "even when no disturbance of the lens has been noticed, glaucoma has sometimes followed."[2]

I have reported this case because of the comparative rarity of similar cases in which reliable data can be obtained.

[1] Priestley Smith, "Glaucoma," *Norris and Oliver System of Disease of the Eye*, vol. iii.

[2] *Diseases of the Eye*, Jackson, p. 445.

INVESTIGATIONS ON EYE MAGNETS.

By Dr. SIEGMUND TÜRK, Berlin.

Abridged Translation from *Archiv f. A.*, Bd. XLII., by Dr. Ward A. Holden.

THE discussions as to the relative utility and power of the Haab and the Hirschberg magnets have so far been conducted solely upon clinical grounds. Thus gradually our ideas have become clearer and the good points of each instrument have been recognized and the former prejudice against the Haab magnet has been removed.

But the fact that we are not altogether clear as to the power of the two magnets explains why the scope of the two instruments has not been accurately determined.

Hirschberg stated that with a point 2.5 *mm* in diameter his magnet held an iron particle weighing 0.5 *kg*. But there are no exact statements as regards its power in respect to smaller particles, such as those usually found in the eye, and as to its effect at various distances.

Haab in the description of his magnet stated what power it had on a piece of iron weighing 1 *g* at 5, 10, and 15 *mm* distance with various strengths of current. He added, illustrating the statement with experiments on pigs' eyes, that small splinters were attracted with much less force than large ones, and this fact has been noticed by all who have used the Haab magnet.

In order to gain more definite information in the matter, I had made 8 elongated iron splinters weighing 1, 5, 10, 20, 50, 100, 250, and 500 *mg*.

In the case of each splinter the power was determined with which the magnets held it or attracted it at distances of 2.5, 10, 25, 40, and 50 *mm*. Their dimensions were as follows:

Weight	Length *mm*	Breadth *mm*	Thickness *mm*
0.001 *g.*	0.8	0.5	0.4
0.005 "	1.6	0.6	0.6
0.01 "	3.5	0.5	0.6
0.02 "	3.3	1.1	0.6
0.05 "	6.5	1.3	0.6
0.1 "	10.9	1.6	0.6
0.25 "	10.8	4.1	0.6
0.5 "	10.7	8.5	0.6

The magnet was placed with its long axis vertical and the splinter, fastened between two sheets of gummed paper, was laid with its free end toward the magnet. To the other end of the splinter weights were attached and I determined the greatest weight that the splinter, at a given distance, could carry without being torn loose.

With Hirschberg's magnet a tip 17 *mm* long was used which was 2.5 *mm* in diameter for a distance 4 *mm* from its end. To the Haab magnet was attached a short cylindrical process 12 *mm* long and 14 *mm* in diameter. For the Haab magnet a full street current of 11–13 ampères was used. For the small magnet a current was obtained from a 2- or 3-cell accumulator, of such strength that the magnet held an iron weight of 0.5 *kg* with an added brass weight of 60 *g*. Later determinations showed that this current was about 3.5 to 4.5 ampères.

The results obtained can of course be applied only approximately to those likely to be obtained in actual operations, variations occurring according to the magnetization of the splinter, its shape, and the size of the polar point.

The relative attractive powers of the two magnets expressed in grammes are given on the following page (Table I.).

This presentation shows conclusively that the attracting power is less the smaller the splinter, but the amount of the decrease is not always commensurate with the weight of the splinter. The relation between the two is most exact when the splinter is 0.5 *cm* away. If the power of attraction on the larger splinters is taken as a measure, in general at short distances the attraction for smaller splinters is greater than

would correspond to their weight, and at longer distances is less. When the relation between the two is not regular, the form of the splinter may be the disturbing factor.

TABLE I.

DISTANCE	MAGNET	WEIGHT OF SPLINTER							
		0.001	0.005	0.01	0.02	0.05	0.1	0.25	0.5
cm		POWER OF ATTRACTION							
5	Haab.....	0.001	0.008	0.04	0.075	0.424	1.1	2.2	3.3
4	Haab.....	0.003	0.021	0.132	0.163	0.62	1.5	3.1	5.1
2.5	Haab	0.013	0.097	0.38	0.57	1.5	3.6	7.3	14
1	Haab.....	0.128	1.07	2	3.3	9	14	38	64
	Hirschberg.	0.0005	0.001	0.012	0.008	0.054	0.139	0.168	0.115
0.5	Haab.....	0.266	2.3	3.8	7.5	16	26	66	126
	Hirschberg.	0.007	0.03	0.013	0.134	0.43	0.81	1.17	1.29
0.2	Haab.....	0.64	3.8	5.7	11	25	39	104	204
	Hirschberg.	0.076	0 275	0.773	1.08	2.45	3.7	4.9	6.1
0.0	Haab.....	16.7	47	42	92	142	154	372	756
	Hirschberg.	13.7	29	32	69	119	122	246	276

The table shows also the noteworthy fact that in direct contact with splinters from 1–250 *mg* in weight the power of the Hirschberg magnet is but little less than that of the Haab. The difference is greater when one replaces the blunt cylindrical tip of the Haab magnet with a longer, conical tip slightly rounded at the end, similar to that described by Haab. With this tip the power of attraction was found to be as follows:

TABLE II.

DISTANCE	WEIGHT OF SPLINTER						
	0.001	0.005	0.01	0.02	0.05	0.1	0.25
cm	POWER OF ATTRACTION						
5	....	....	....	....	0.356	....	1.617
4	....	....	....	....	0.606	1.317	....
7.5	....	0.066	....	....	1.5	3.0	....
1	....	0.7	....	....	7	....	....
0.5	....	2.9	....	9.6	19.5	28.5	....
0.2	....	8.2	....	....	41.5	....	....
0.0	25	....	85	....	....	270	....

Thus at distances from 5–1 *cm* the power is equal or less with the conical tip than with the blunt tip. At 0.5 *cm* it is about $\frac{1}{3}$ greater, and at 0.2 *cm* and in direct contact nearly twice as great.

In comparing the strength of the two magnets, the difference is remarkably slight when they are in direct contact with small splinters, but the difference is very marked when the splinter is removed any distance from the tip. Even at 2 *mm* the Haab magnet is from 7–21 times as attractive for splinters weighing 1–250 *mg* as is the Hirschberg, and the more the distance is increased the more favorable are the relations for the Haab magnet.

Beyond 1 *cm*, comparison is difficult since the power of the Hirschberg magnet is so slight, but even at 2.5 *cm*, approximately the sagittal diameter of the eye, the Haab magnet attracts a splinter weighing 1 *mg* with 13 *mg* added weight.

It is evident that an instrument so powerful as the Haab magnet must be used with caution. The correct direction of the eye to be operated upon has been discussed fully in the papers by Haab and Hirschberg. A second requirement is that of regulating the power of the magnet and in every case using power sufficient only to extract the foreign body. This presents some difficulties since the relative power of the magnet increases greatly as the splinter is drawn towards it. Two methods of avoiding this lack of uniformity have been given by Haab. The eye may be brought close to a magnet with a rheostat and the power of the magnet gradually increased; or the full current being on, the eye can be brought toward the magnet gradually and the extraction accomplished at the greatest possible distance.

Experiments with the current reduced from 12 to 5 ampères showed the ratios of the powers in the two instances to be as follows:

At 5	*cm*	distance	with	a	splinter	of	50 *mg*	= 3.5 :1
" 2.5	"	"	"		"	"	50 "	= 1.53:1
" 1	"	"	"		"	"	20 "	= 1.5 :1
" 1	"	"	"		"	"	50 "	= 1.5 :1
" 0.5	"	"	"		"	"	10 "	= 1.39:1

At 0.5 *cm* distance with a splinter of 50 *mg* = 1.36:1
" 0.5 " " " " " 250 " = 1.26:1
" 0.2 " " " " " 5 " = 1.17:1
" 0.2 " " " " " 50 " = 1.30:1
" 0.2 " " " " " 100 " = 1.26:1
" 0.0 " " " " " 1 " = 1.06:1
" 0.0 " " " " " 50 " = 1.16:1

The power of the magnet over splinters at a distance is thus, with the diminished intensity of the current, reduced in greater measure than its power over splinters near by.

It cannot be denied that the reduction of the absolute power of a magnet offers a certain protection against too strong attraction, but this does not give us a uniform attraction with the superfluous power eliminated. Therefore medium-sized magnets cannot take the place of the large Haab magnet. Apart from the fact that their attractive power is too little for small splinters, the difference between their action near-by and at a distance, under the highest current they can carry, is entirely similar to that with the large magnet when the current is reduced. Experiments with the medium-sized Hirschmann's magnet of 25.5 *kg* weight and 30 *kg* power support this view.

TABLE III.

DISTANCE	WEIGHT OF SPLINTER							
	0.001	0.005	0.01	0.02	0.05	0.1	0.25	0.5
cm	POWER OF ATTRACTION							
4	.....	.....	....	....	0.109 0.21	0.381 0.601	0.49	0.628
2.5	.....	0.027	....	0.12	0.546 0.856	.....	....	.....
1	.....	0.408	....	....	5.6	.....	....	.....
0.5	.....	1.194	....	....	12.2	.....	....	.....
0.2	0.556	2.0 2.6	....	....	17.4	.....	73	.....
0.0	15.8	43.8	....	....	116 124	.....	....	.....

Since we cannot change the non-uniformity of the attracting power upon the splinter in the course of the extraction either by diminishing the current or by using medium-sized magnets, it remains to be seen whether increasing the

distance between the eye and the magnet is a measure more suitable for this purpose.

With the large magnet at a distance of 5 *cm* from a splinter weighing from 1 to 500 *mg*, with a current of 12 ampères, the power as compared with that exercised under the same conditions at 2.5 *cm* is 1:7; while for the distances 2.5 and 0.2 *cm* the ratio is 1:22.3.

The significance of this is as follows: If it is possible, with a distance of 2.5 between magnet and cornea, to draw a splinter forward, we have at the end of the operation a power only seven times as great as at the beginning, when the splinter lying in the retina was 5 *cm* away. If the operation is performed with the magnet close to the cornea, the power at the end of the operation, with the splinter perhaps 2 *mm* away, would be 22 times as great as at the beginning, when the splinter was 25 *mm* away.

The farther, therefore, the instrument is removed from the entire field of the operation, the more uniform will be the attraction for the foreign body in its entire course; and the stronger the magnet, the farther it may be removed from the eye and the more uniform will its attraction be.

In order to keep the direction of the eye correct, I have had made brass tubes 14 *mm* in diameter and 0.5 to 4 *cm* in length, which are slipped over the tip of the magnet, the longer tubes being used for larger foreign bodies. With very small splinters the magnet must be brought close to the eye.

Some experiments were made by cutting out a piece of the wall of a pig's eye and a splinter dropped down in the vitreous, the effect of the large magnet being watched through the opening. It was found that with the smallest splinters attraction was exerted when the magnet was some centimetres from the eye, and with larger splinters at a distance of from 5 to 10 *cm*. A splinter weighing 100 *mg* was drawn into the anterior chamber with a magnet 3 *cm* away, a 50-*mg* splinter from a distance of 1 *cm*, and a 20-*mg* splinter from a distance of 0.5 *cm*. Splinters weighing from 5 to 10 *mg* required direct contact of the magnet.

As regards the magnet to be used, my views are as follows:

the small magnet may be used when, without injuring the vitreous, it can be brought within a few millimetres of the foreign body. When the foreign body is in the anterior or posterior chamber or in the iris or lens, this can be accomplished by making a corneal section.

In the case of deeper-lying foreign bodies, the large magnet should be used.

Only when the large magnet does not attract a very small or entangled foreign body, or when there is danger of lacerating the uninjured lens in extracting a large foreign body, is the introduction of the small magnet into the vitreous indicated to accomplish the extraction.

ULCUS RODENS CORNEÆ.

By Dr. HILLEMANNS, Duisberg, Gy.

(With Plates I.–II. of Vol. XL., German Edition.)

THIRTY-TWO years ago, Mooren described the form of corneal ulcer which he called rodent, and since then about thirty-five cases have been more or less accurately described. The chief characteristics of the affection, which have been brought out sharply in the more recent papers, are as follows: It begins at the margin of the cornea with a narrow grayish-white infiltration, which in a short time becomes an ulcer. It spreads at intervals with intermittent and often severe signs of irritation (ciliary neurosis), which are out of relation to the corneal process. The gray base of the ulcer is limited from the healthy portion of the cornea by an irregular, undermined line of demarcation, with a grayish-white infiltration at the points of progression. There is no marked purulent infiltration of the base of the ulcer. Hypopyon is absent in most cases, at least in the beginning. The ulcer spreads about the margin of the cornea and towards the centre with a chronic course of months' duration, and in the majority of cases eventually destroys the entire surface of the cornea. It is usually shallow, and perforation is unusual. It may occur, however, as in cases of serpent ulcer, by a fresh ulcer developing in tissues cicatricial from earlier ulceration, or perhaps the therapeutic efforts made may cause perforation. Plastic iritis is a frequent complication, and the case which I shall describe shows that the deeper membranes of the eye may be implicated.

As respects the margin of the ulcer, Koll says: The serpent ulcer has a regular circular outline from which gray stripes radiate out into the parenchyma of the cornea, while the rodent ulcer has an irregular, notched margin and is bordered toward the normal portion of the cornea by white dots, which later coalesce and form the margin, while in serpent ulcer points appear at the margin, which then breaks down over short, interrupted areas even in the stage of repair.

Repair follows the necrosis so immediately that the thinned opaque portion of the cornea left by the ulceration soon regains its lustre from the presence of new epithelium and vascularization takes place. Even in serpent ulcer the proliferation of epithelium begins very early at the margin which is not progressing, but it is long before the new epithelium reaches the advancing margin. And in serpent ulcer repair takes place without vascularization unless the ulcer has been marginal or the iris has been incarcerated.

As our microscopic preparations show (Pl. II.), the regeneration of the epithelium is excessive and the underlying layer of vascular connective tissue attains a considerable thickness, but nevertheless the normal height is rarely reached and the level of the repaired base of the ulcer lies lower than that of the healthy cornea. Dufour ("Sur l'ulcère rongeant," *La clinique opht.*, May 25, 1897) says: "The process seems to be limited to the subepithelial tissue, and from the examination of such eyes in the living, the only examinations that I have been able to make, I think that the lamellæ of the cornea are left intact." He even suggests the designation "subepithelial ulcer" to express what is characteristic in the affection.

Without denying that in many cases, and perhaps in all in the beginning, the ulcer creeps along close under the epithelium, I cannot agree with Dufour's view. Even observation on the living, and better our preparations (Pl. II.), show that if the ulcer is deep, or deep in certain parts, a portion of the substantia propria will be involved.

In looking over the reports of cases, it appears that the patients were from twenty to seventy years old, the

majority being over forty. The number of the two sexes was equal. In many cases the patients were anæmic and debilitated, though frequently they were apparently healthy. Some had a history of rheumatism, and two of Dufour's six patients had had intermittent fever. In some cases there was lachrymal obstruction, but it is not likely that this plays the important rôle in rodent ulcer that it does in serpent ulcer. In the twenty-two cases in which information was offered in regard to both eyes, both were affected in eleven cases, and in some cases symmetrically. Usually the process had run its course in the first eye before the second became affected. The simultaneous appearance in the two eyes is very rare. The most important complication is the severe pain, which is intermittent, like the course of the affection, and at times assumes the character of a neuralgia of the upper branch of the third nerve.

The location of the corneal nerves explains the pain caused by the progression of the ulcer in the superficial layers. There are reports of cases complicated with herpes zoster.

The secretion from the conjunctiva is usually inconsiderable, but there is frequently some œdema of the lid. Hypopyon and perforation have been mentioned above; in the eye which I examined there was hyphæma. The tension is not particularly altered. In the typical case the ulcer begins at the limbus but not at any particular point. In one case, I observed a second marginal ulcer appear opposite the first and become connected with the first by a narrow furrow which divided the unaffected portion of the cornea into two parts, until eventually the entire cornea was involved (Figures IV., Pl. I.). The duration of the process is from 4–10 months usually, but it may last 1–2 years. The disease is certainly rare. In 11,000 patients seen at Bonn I did not find a single case; at Utrecht in 7000 patients I saw it three times. Mooren saw one case in 40,000 patients; Jany, one in 66,000; and Vossius, three in 25,000.

As regards diagnosis, it can be confounded in the beginning, with the so-called catarrhal marginal ulcer only. Annular ulcer resembles it somewhat in its peculiar manner of

extension, but in the cases I have seen the course was much more rapid, the tendency to perforation greater, and the conjunctival secretion more excessive.

The alterations in sensibility deserve special attention. Ahlström states that in his case from the beginning the sensibility of the entire cornea was reduced and that of the centre of the cornea almost abolished. Schmidt-Rimpler found no anæsthesia in his cases. Vossius in three of his five cases found anæsthesia of the centre of the cornea when the ulcer was in the periphery. Nieden did not find anæsthesia of the cornea. In two cases I made examinations as regards sensibility with the following result. The sensibility was preserved in the normal portions of the cornea but abolished at the places where the ulcer had extended deep enough to destroy the nerves in the superficial layers of the cornea. In one case (see Pl. I., IV.), the two areas of normal cornea had normal sensibility. Two or three months later, the process had spread over the entire cornea, which was thin, of a grayish color, vascular, and wholly anæsthetic. From such thinning, opacity, and anæsthesia one can diagnose a rodent ulcer that has run its course, for no other disease alters the cornea in this manner.

As regards etiology, two explanations present themselves: a bacterial affection and a spreading necrosis of the superficial layers of the cornea dependent upon a nervous basis (Ahlström), perhaps combined with the colonization of cocci under the elevated epithelium (Schmidt-Rimpler). We have seen that the affection cannot be regarded as an expression of a general cachexia. The bacteriological researches have resulted as follows: Ahlström could not obtain from the undermined margin of the ulcer or from other portions of the cornea or from the conjunctival sac any micro-organisms other than those found in various diseases of the cornea and conjunctiva and even in the healthy eye. The secretion inoculated into the rabbit's cornea always produced an ordinary infiltrated ulcer, having no similarity to rodent ulcer. Schmidt-Rimpler, Vossius, and Dufour also concluded that bacteria had nothing to do with the development of the affection, and this is my own conclusion after culture

experiments and examination of the cornea with the microscope.[1]

I am inclined therefore to regard the breaking down of the superficial layers of the cornea as being due to a disturbance of the nerves governing the nutrition and vitality of the corneal tissues.

As regards treatment, Fuchs believes that cauterization will bring about recovery in every case. Most other writers do not share this optimistic view, although this treatment has sometimes checked the disease. Various sterilizing and caustic applications have been made at the progressive margin of the ulcer. In one case, at Professor Snellen's suggestion I treated the ulcer with tincture of iodine, two applications made within a week bringing the ulcer to a standstill, but its subsequent history is unknown.

In the majority of cases, the final outcome was a leucomatous opacity of the greater portion of the cornea, with vision reduced to the ability to count fingers near-by. In Case I., represented on Plate I., there remained after four cauterizations a central islet unaffected, and the patient who had an opacity of the lens retained the vision possessed before the ulcer developed. After the process has come to a standstill, the opacity gradually clears up. A unique case was reported by Koll. Treatment consisted of atropine and warm fomentations and a single paracentesis which temporarily relieved the pain. After ulceration extending over the entire cornea the opacity so far cleared up that vision was as good as before. Perhaps this case should suggest to us to leave obstinate cases rather to nature's processes than to burn, cauterize, and scrape these corneas and thus cause greater cicatrization.

Personally I observed three cases in the Utrecht clinic in 1895. One was examined microscopically. The patient was a woman of forty-eight whose left eye had been inflamed since September, 1894. Two years before, she had had smallpox, and she had suffered from rheumatic pains. When admitted in February, 1895, there was a rodent ulcer

[1] Andrade (*Annali di ottalm.*, 1900) has since described a bacillus found in rodent ulcer and producing a similar affection when inoculated in rabbits, but no verification of this has yet been made.—TRANS.

in the lower-inner quadrant of the cornea, V=fingers at 1 *m*, T — 1. The ulcer spread in spite of the most varied treatment: bichloride application, scraping with a sharp spoon, pencilling with tincture of iodine, cauterization, yellow-oxide salve, and internal medication. February 25th it had the form shown in Fig. III[1]., Plate I. On April 18, 1895, on account of the severe pain, the patient requested that the eye be enucleated. The cornea superficially was destroyed, excepting a small islet as shown in Fig. III[2]., V = movements of hand at 2 *m*, projection of light and tension good. After hardening in formol, vertical celloidin sections were cut.

Microscopic examination. — A section of the cornea passing through *a b* (Pl. I., III.[2]) shows the cornea still preserved as an islet only, bounded above by the progressive margin and below by the ulcer. Beginning at the upper limbus we find a thickened irregular layer of epithelium, beneath which is a broad layer of connective tissue infiltrated with small cells and containing numerous vessels and small hemorrhages. Bowman's membrane is wanting. Toward the ulcer the layer of granulation tissue grows thinner, and at the margin of the ulcer the epithelium alone sends its processes out over the floor of the ulcer. The corneal lamellæ are well preserved in about two thirds of their thickness, and, in the neighborhood of the ulcer, moderately infiltrated. On the floor of the ulcer there is detritus with a thick layer of pus cells. The progressive margin is overhung by epithelial processes and farther back by a thin layer of corneal lamellæ, so that at the outer margin about one third of the thickness of the cornea is undermined. In no preparations could an elevation of the epithelium alone be found; there was always also a layer of corneal lamellæ of varying thickness. The lamellæ break down first, so that overhanging flaps of epithelium remain. Near the progressive margin vessels and hemorrhages are found between the lamellæ, and the membrane of Bowman is wanting. Farther from the margin the membrane of Bowman is rolled up and for a short distance detached.

Another picture is presented below the corneal islet, where we meet with an older portion of the ulcer that has come to a standstill. Here there has been destruction of perhaps the anterior three-fourths of the thickness of the cornea. The floor of the ulcer proper is of but slight extent, since the proliferation of epithelium reaches

nearly to the undermined margin, which at this point comprises about the anterior three-fourths of the cornea. Near this margin the epithelium and membrane of Bowman are wanting for a short distance. The ends of the lamellæ forming the undermined margin are swollen and the nuclei stain poorly—beginning necrosis. Corresponding to the depth of the ulcer, a tract of leucocytes passes into the preserved portion of the cornea, indicating the posterior limit to which the cornea would be destroyed in the progress of the ulcer. In the tract are some small vessels. The depth of the ulcer varies in different preparations, and in many the cornea was destroyed down to a narrow posterior layer, representing one sixth or one fifth of the normal thickness. The ulcer, where it has undergone repair, consists of three well-marked layers (Pl. II., II.): (1) A new-formed, irregular epithelial layer thicker than the normal; (2) a middle layer of scar tissue, in its younger portions rich in vessels and nuclei, in its older portions of a finely fibrillary structure presenting more the structure of normal cornea, — this layer decreases in thickness from the limbus toward the ulcer and gradually raises the epithelium, which is just extending out over the clearing ulcer; (3) the layer of preserved lamellæ. The membrane of Descemet and the endothelium are everywhere intact. The branches of the anterior ciliary arteries which contain hyaline thromboses run in the outer layers of the sclera and are mostly on the side corresponding to the older part of the ulcer. Within the vessels are both well preserved blood-corpuscles and broken-down corpuscles and at places merely a homogeneous mass (Pl. II., III.). Below the islet of healthy cornea the ulcer has the appearance shown in Fig. iv, Pl. II., which is from a section in which the surface of the cornea is still present to a great extent, and on one side not yet separated from the limbus by the spreading ulcer. We find, however, on this side marked superficial infiltration, pannus formation with hemorrhages, and an irregularly thickened epithelial layer over the membrane of Bowman, which is in part destroyed. Finally in a third sort of section we find only the repaired ulcer with the three layers mentioned. Notwithstanding the extensive proliferation of epithelium and connective tissue, the physiological thickness of the cornea is reached only near the limbus, the greater part of the cornea remaining thin, yielding readily to the pressure of a probe. At the bottom of the anterior chamber lies a small hyphæma; in the chamber angle and on the iris are gran-

ular remains of exudations; and there are posterior synechiæ. The fibrillary remainder of the vitreous is drawn forward, the retina is detached and cystic, and there is an exudation among the rods and cones. Doubtless the uvea participated in the process, and to exudations from it are to be attributed the fluidifying of the vitreous and the detachment of the retina; it is much thinned and the middle and inner layers are scarcely recognizable.

The figures on Plate I. require a brief description. The tinted areas indicate the ulcer, and the curving lines blood-vessels; I. and II. are from the Bonn clinic, and are taken with the kind permission of Professor Saemisch from the dissertations by Gottschalk and Dormagen. In I., a b c indicate the points of denser infiltration; a central islet remains intact with $V=\frac{20}{200}$. In II. the straight line indicates the keratotomy incision, which did not stop the progress of the ulcer, as did not cauterization repeated four times; d e indicate ulcers in ulcers; $V=\frac{1}{00}$. III. and IV. are from the Utrecht clinic while I was assistant there. The microscopic preparations (Plate II.) are from III.

IV. represents the course of a rodent ulcer in a healthy peasant of twenty-four. At a there appeared a marginal ulcer, from which a narrow superficial furrow, later becoming broader and deeper, extended to the margin of the ulcer, dividing the preserved portion of the cornea into two islets. At b there is an ulcer in an ulcer. Eventually, in spite of every therapeutic effort, the entire surface of the cornea was destroyed and vision reduced to fingers at 2 *m*.

My sincere thanks are due to my former teacher, Professor Snellen, for permission to report these cases observed in his clinic.

INSUFFICIENCY OF DIVERGENCE AS AN ETIOLOGICAL FACTOR IN CONCOMITANT CONVERGENT STRABISMUS: ITS IMPORTANCE, DETERMINATION, AND TREATMENT.[1]

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THE determination of the underlying etiological factors presented by any case of convergent strabismus, and of the relative importance which should be assigned to each is a problem exceedingly difficult of solution, so difficult, in fact, that it is to be doubted if it be possible to arrive at a correct solution invariably, with the means at present at our command. Still, it would seem but logical that some such attempt should be made before treatment, more particularly operative treatment, is instituted. That the original cause of convergent strabismus is almost invariably the same, and consists essentially of an abolition of binocular single vision and of a relative disproportion between accommodation and convergence, is almost universally admitted. This theory, as simple as it is great, explains, to the satisfaction of most of us, the origin of squint. It does not, however, explain its perpetuation in cases in which the disproportion between accommodation and convergence may reasonably be considered as having ceased to exist, and the etiological factors of strabismus, while almost invariably the same at the commencement, may differ considerably in different cases as time goes on, the continuance of the angular deviation

[1] Read before the Ophthalmological Section, New York Academy of Medicine, February 17, 1902.

seeming to be responsible in most cases, though perhaps not in all, for at least one and perhaps two secondary conditions. These are an insufficiency or abolition of the function of divergence, and possibly, though the writer believes but rarely, a permanent shortening of the internus of the squinting eye. A case of permanent convergent strabismus may present, therefore, at the time of examination all, or several, of six etiological factors, abolition of the function of binocular single vision, monocular amblyopia, hypermetropia, spasm of convergence, permanent shortening of one internus, and a secondary insufficiency of divergence. The purpose of this paper is to deal with the insufficiency, or abolition, of the function of divergence, the importance of which condition, as an etiological factor in convergent strabismus, the writer believes to have been greatly underestimated, for it is present in the vast majority of cases, frequently *seems* at least to be the only obstacle in the way of cure, and in such cases treatment directed to its relief forms, in the writer's opinion, our safest, most generally satisfactory, and frequently a truly brilliant method of treating squint.

Occurring as a primary lesion in latent anomalies, insufficiency of divergence is by no means very rare, and the patient who suffers from "panorama asthenopia," whose diverging power equals perhaps but a one- or two-degree prism, whose convergence is normal, and who presents no asthenopic symptoms for near work is sufficiently familiar, although perhaps not very common. Can such a negative convergence become entirely positive and be the primary determining factor in convergent strabismus, or, in other words, can an insufficiency of divergence be so marked as to cause a convergent squint, an excess of converging power, if present, being secondary? In extremely rare instances this may be the state of affairs revealed by examination, and the interesting case recently reported by Doctor Lynch and Doctor Duane[1] may be cited as an example. For our purposes, however, such primary cases are of service principally as showing that insufficiency of divergence is a distinct pathological entity. The insufficiency of divergence which usually

[1] ARCHIVES OF OPHTHALMOLOGY, vol. xxx., p. 425.

accompanies convergent strabismus is doubtless a secondary condition, due in all probability to the continued and absolute disuse of this function resulting from the maintenance of the deviation, and is accompanied by an atrophic appearance of the external recti, which apparently atrophic condition their continued use in lateral movements is generally powerless to prevent. The lateral excursions of the eyeball are ordinarily not extensive, and would seem to require less muscular effort for their performance than the movements of convergence and divergence. Certainly nothing is more common than to find a normal internal rotation of each eye, when tested separately, in well-marked cases of functional insufficiency of convergence, and the same may be said of the external rotations in functional cases of insufficiency of divergence. These are latent anomalies, and may exist either conjointly or separately, without any excess of the opposing function in cases which apparently may continue to be latent indefinitely, a fact which would tend to show that convergence and divergence are both active and independent functions. The active character of convergence has not been doubted, but it has been held by good authority that divergence is a passive act, due to a relaxation of convergence, which relaxation can reach such limits as to cause the eyes actually to diverge, their divergence then being due to their tendency to assume their position of equilibrium, which is asserted to be that of slight divergence, and, by some, to coincide with the axes of the orbits. It is further stated by the supporters of this theory that, whereas convergence can be largely augmented by prismatic exercise, the power of divergence is but little, if at all, increased by this means, and it is held that an active function should be capable of augmentation by increase of use. Duane ("Motor Anomalies of the Eye") cites these arguments, but dissents from this view of the nature of divergence, preferring to regard it as independent and active. With his opinion the writer is heartily in accord, and, as the conclusions in this article depend largely for their value upon the assumption that the function of divergence is active and independent, it would seem proper to present some facts in support of this

theory. The case of paresis of divergence (Lynch and Duane) already cited has considerable bearing upon this point. In this case, the function of divergence was alone affected, the lateral rotations were of normal extent, and the power of convergence was not increased, and yet the insufficiency of divergence was such that actual convergent squint resulted. That the power of divergence cannot be increased by prismatic exercise is, in the writer's experience, true, but it is also true that it can be increased to many times the normal by advancement of the externi, without reducing the power of convergence below normal limits. For example, in a case of convergent strabismus, operated upon by this method, and in which binocular single vision was re-established, the power of divergence equalled a prism of twenty degrees, the convergence power being about nine-metre angles. In this case, the diverging power was raised to nearly three times the normal, without any operative procedure involving the interni, and, although the argument, purely from analogy, that a function to be active must be capable of augmentation, seems to the writer to be a poor one, the results of this operation, while perhaps not entirely conclusive, would seem to answer it fairly well. The examination of certain cases of convergent strabismus throws additional light upon this subject. A small percentage of these resume binocular fixation after the exhibition of atropine and the prolonged use of their full correction. In those which do so immediately, for the most part recent cases, the cure of the squint by the suspension of the accommodation, the consequent relaxation of the convergence spasm, and the resumption of a condition of proper proportion between accommodation and convergence, point to an excessive and disproportionate convergence as the sole muscular etiological factor. In other cases, which develop parallelism only after a considerable period, the writer believes that, in the greater number, a secondary insufficiency of divergence is present, as evidenced by restricted lateral rotations, but that this condition is recovered from and parallelism consequently resumed, as a result of the restoration of the normal balance between accommodation and

convergence. Disregarding for the moment, however, the value of the limitation of the external rotations in the diagnosis of a secondary insufficiency of divergence, it might still be said of these cases that the excessive convergence was the only muscular anomaly present, that it finally became normal, or nearly so, and thus admitted of the re-establishment of parallelism, and that the cure was effected solely by this means, without the aid of the recovery of any secondary condition. Admitting, for the present, the justice of this criticism, the writer's reason for dissenting from this view will, perhaps, appear more clearly when we come to speak of the diagnostic value of the field of fixation, and we will pass for the time being to the consideration of the largest class of cases of convergent strabismus, the class in which parallelism is never re-established, even by the most prolonged use of atropine and glasses. Why, in these cases, does the deviation persist? Is the difference in the visual acuteness of the two eyes the cause of its permanency? Probably not, for in many of these cases the squinting eye is not markedly amblyopic, while in many recent cases, cured by atropine and glasses, the amblyopia is excessive. If the convergence excess were the only determining factor in all cases of strabismus, should we not be entitled to expect that with time the excess ought to become sufficiently reduced, under the influence of a normal accommodative effort, to admit of the re-establishment of parallelism in a larger proportion of cases than we at present witness? It seems to the writer that such should be the case, and he ventures to hope that others will be disposed to agree with him and to accept, advisedly at least, the theory that some other factor or factors are accountable for the maintenance of the deviation. A contracture, or permanent shortening of the internus of the squinting eye, accompanied by similar changes in the capsule, has been much dwelt upon by Parinaud in this connection, and is made the basis of the treatment which he advocates, but, with all due deference to the high source whence this opinion comes, the writer believes that the value of this condition as an etiological factor has been greatly overestimated. A permanent shortening of this

muscle should markedly restrict the external rotation of the squinting eye, and it is difficult to understand how such shortening, while causing perhaps but ten degrees of limitation in the fixation field, can be held accountable for the maintenance of an angular deviation, say of thirty-five. Furthermore, if such shortening were the important and determining factor, we should expect to find a *very marked* difference in the extent of the external rotations of the two eyes, the external rotation of the squinting eye being decidedly deficient. As a matter of fact the limitation almost invariably involves both eyes and the difference rarely amounts to more than five degrees, while in cases in which the difference is much greater than this, the writer has never failed to find upon dissection such an extreme degree of atrophy of the externus of the squinting eye as to leave no doubt in his mind as to the cause of the difference in the extent of the rotations. The bilateral limitation would seem to denote the existence of a binocular affection, while fortunately, in seeking its cause, anatomy comes to our aid, and the writer wishes to state that he has yet to find a case in which, with marked limitation of the external rotations, an atrophic appearance of the externi was not revealed upon dissection. Atrophy of the externi, of sufficient degree to cause limitation of the external rotations, must even more seriously affect their associated action in producing divergence, and it is this atrophy, with the insufficiency of divergence that it produces which is responsible in the writer's opinion for the maintenance of the deviation, in part directly and in part by permitting the continuance of the convergence spasm after the normal balance between accommodation and convergence has been restored or at least approximated. For the reasons enumerated, the writer is disposed to regard the function of divergence as independent of that of convergence, for it would seem to him reasonable, at least, to consider as something more than a passive attribute to convergence, a function which can become primarily insufficient or even paretic without an immediate increase in the power of convergence, which can be markedly augmented by operative procedure

without reducing the power of convergence below normal limits, and a secondary insufficiency of which he thinks can properly be held accountable for the maintenance of the deviation in our largest class of cases of convergent strabismus.

Although it appears that an insufficiency of divergence exists in most cases of convergent strabismus, such an insufficiency does not seem to be an invariable accompaniment of all cases, even of all those of considerable duration. What means are at our disposal for determining its existence? Nothing is easier than to estimate the power of divergence in a subject who possesses binocular single vision, and the strength of the prism which he can overcome "in abduction" gives us reliable information upon this point, but, when binocular single vision has been abolished and binocular fixation also no longer exists, this means ceases to be at our disposal. The evidence then obtainable is not exact, to a certain extent it may be said to be merely presumptive, and, on account of the conditions existing, it is to be doubted if it ever can be more than this, but the presumptive evidence seems to the writer to be so strong, and the results of treatment based thereon are so generally satisfactory, that he ventures to present the reasoning which he employs to determine the existence of this secondary condition. Dr. Duane (*op. cit.*) has pointed out that it is during *distant* vision that latent divergence anomalies, excesses or deficiencies, are most markedly manifest, and, although a divergence anomaly may possibly be so great as to present symptoms for near points as well, it will always be exceedingly well-marked, for distance, when existing in a less degree for near. The same writer has also shown that the reverse is true of the latent convergence anomalies, their most pronounced symptoms being manifest for *near points*, although they, in like manner, when very pronounced may overstep the bounds of near vision and be manifest, though to a less degree, for distance. It would seem that this line of reasoning may be of use when dealing with actual deviations, as well as with latent anomalies, and, while not enabling us to be positive of the existence of an insufficiency of divergence in any case of convergent strabismus, it may aid

us in feeling reasonably sure of its absence in certain cases. Thus, a convergent squint, which is manifest only for near points, is probably dependent solely upon a convergence excess, and is not associated with an insufficiency of divergence of any great degree, the divergence function being sufficiently powerful, at least, to maintain parallelism for distance. When, however, the deviation is manifest both during near and distant vision, should we assume necessarily, from this circumstance alone, that a secondary insufficiency of divergence is present? The writer believes that we should not. The manifestation of the deviation during distant vision is a certain amount of evidence of the existence of a divergence insufficiency and is doubtless of some value, but the writer thinks that some of these cases, even some of those of considerable duration, may still present for the most part their primary convergence excess. The prolonged effect of a full correction should aid us in determining this point, for, as previously suggested, except perhaps in the most obstinate cases, we should expect an uncomplicated convergence spasm to relax in time under the long-continued influence of a normal accommodative power, and it certainly would seem proper that this means should be employed, before operative measures are instituted for the relief of a divergence insufficiency, which possibly may not exist. Fortunately, in most of these cases, the field of fixation is capable of furnishing us with additional information, the value of which the writer considers to be very great indeed, *when a decided limitation in the extent of the external rotations is revealed*, for such limitations must show, not alone that the rotating power of the externi is diminished, but that, to a much greater degree proportionately, their conjoined action in effecting the function of divergence is deficient. In the very large majority of these cases, the external rotation of each eye when tested separately will be found subnormal. The restriction is seldom great, sometimes amounting to fifteen degrees, but more frequently to about ten, and, while it is generally more pronounced in cases of squint of high degree than in those in which the deviation is slight, the amount of restriction present cannot

be said to bear any constant relation to the degree of deviation. This statement is true at least of cases in which the field of fixation is examined shortly after the subject's refraction is tested for the first time. Dr. Duane, in a recent paper on the examination of the ocular muscles, places but little reliance on the field of fixation as a guide to operative procedures in *latent* anomalies, stating, among other reasons, that its extent varies so greatly in different normal subjects that it is difficult to estimate the value of the findings in any particular case. Dr. Duane's statements, however, refer to latent cases and deal with these principally from the viewpoint of excessive, not restricted, movements, cases which, in the main, are to be treated by tenotomies of the muscles governing the functions supposed to be in excess. In most of the cases to which he has reference, no paretic condition exists, and the writer thinks that the field of fixation can be relied upon pretty generally to show a comparative restriction in some of its meridians when paresis is present. The comparative restriction of the external rotations found in these cases of convergent strabismus is due to a paretic condition, structural in nature, and dependent upon a partial atrophy of the externi, which atrophic condition is always apparent upon dissection and exhibits a fixation field identical with that shown by a moderate degree of paresis affecting both sixth nerves.

When, in a normal subject, the perimeter is employed to determine the field of fixation, we very generally find in the meridians not obstructed by the brow and nose that the limits thus obtained are somewhat more extensive than those regarded as average by surgeons who use the tropometer, and this may possibly be due to the fact that the test object furnishes at all times a continuous point of fixation for the eye, thus enabling the subject more readily to maintain his extreme degree of rotation. The "double dot" recommended by Dr. Duane is extremely satisfactory as a test object in the case of adults, or of persons generally of fair intelligence. These will readily appreciate the blurring which ensues, when the point of extreme rotation has been reached. In cases of marked amblyopia, however, it is in-

applicable, and the employment of larger test objects is unsatisfactory, while with children it is apt to be misleading. A small lighted taper would seem to be most generally useful for this purpose in cases of strabismus. Most of our patients are children, and this method further permits of the estimation of the degree of the deviation while the accommodation is paralyzed with atropine, and the determination of the field of fixation at the same sitting. By observing the corneal reflection, particularly when the pupil is fully dilated, it is exceedingly easy to decide when the eye has reached its extreme limit of rotation. The examination of a number of normal eyes by means of the perimeter, leads the writer to believe that the external rotations should not fall much below fifty degrees, except in cases which present a more or less generally restricted field. Indeed the external rotations may exceed this limit. It is, however, with restricted and not with excessive movements that we are concerned, and in cases of squint in which the internal rotations are normal or excessive, and a diminished power of rotation in other meridians is not apparent, the writer has come to regard as distinctly pathological an external rotation of forty degrees or less, and in the cases upon which he has operated he has never failed to find a limitation of this degree associated with an atrophic appearance of the external recti. As already stated, the restriction is apt to be slightly more marked in the squinting eye than in the eye which fixates. To what is this difference due,—to a permanent shortening of the internus of the squinting eye and subsequent changes of a similar nature in the surrounding tissues? The writer believes that such is not the case, and, while not denying the possible existence of this condition, he thinks that it has little to do with the difference in the extent of the rotations, or, for that matter, with the maintenance of the deviation. In cases in which the difference referred to is very marked, the difference in the actual size of the externi is an exceedingly prominent feature. This state of affairs is best observed in the cases of long duration which are occasionally seen in adults. In such cases the external rotation of the fixing eye may reach nearly the normal

limits, while that of the squinting eye may be reduced to thirty-five degrees. Such a field of fixation is identical with that of a paresis of one externus, which is indeed exactly the condition which exists, the paresis depending upon an actual muscular lesion, and, upon dissection, the externus of the squinting eye will be found markedly atrophic, sometimes hardly an eighth of an inch in its transverse diameter, while that of the fixing eye may be nearly or quite normal in appearance. To conclude the consideration of these cases, which form by far the largest number that we meet, it would seem that we can be reasonably sure of the existence of a secondary insufficiency of divergence when the deviation continues to be manifest for distant as well as for near points after the prolonged employment of the full correction, and the external rotations are then found to be reduced to forty degrees or less.

There is another class of cases, however, in which the indications are not so clear. In these, although the deviation is manifest both during distant and near vision, the external rotations reach a degree that we are disposed to consider as normal, that is to say somewhere between forty-five and fifty degrees, while the extent of the rotations in other meridians may either be normal or excessive. Although the writer has examined a number of such eyes, his operative experience comprises but two such cases, and he regrets to state that, in both, operation was performed shortly after they were seen for the first time, without waiting to witness the result of a prolonged use of the full correction, which might have aided in elucidating matters. Both were cases of considerable duration. In both, the externi were advanced. In one, these muscles were decidedly atrophic and the lateral deviation was cured, but, unfortunately, one of the inferior stitches slipped upon the second day, causing a slight vertical deviation which, while it did not appreciably mar the cosmetic effect, prevented absolute fixation. In the other, the recti were large and fleshy and the operation was an absolute failure. Any deductions drawn from these cases seem hardly admissible, but it is perhaps just possible that, in the case presenting atrophic recti, an insufficiency

of divergence was present, and that it was absent in the case in which they were fleshy, the latter consisting of a pure convergence excess. This, at any rate, would be an explanation, neglecting the possibility of a fault of operative technique as the cause of failure in the second case. In cases of this class, it is possible that the field of fixation may still afford us some information when, although the external rotations seem to be normal, other rotations are excessive. Some persons possess a greater rotative power in some or in all meridians than do others, and in these an external rotation of forty-five degrees, or perhaps more, might be taken to indicate a *relative* insufficiency, for it is only by comparison in any case that the field of fixation seems to be of real value.

The methods enumerated would appear to be all that are at our disposal for determining the existence of a secondary divergence insufficiency in cases of convergent strabismus. Determined by these methods, this condition would seem to be most common and most marked, as a rule, in cases which have lasted some time, particularly in adults who have squinted since childhood. In the most recent cases, we should not expect to find it, an assumption which is borne out by the fact that these frequently recover with the aid of atropine and glasses. In early childhood, however, it is common enough, well marked, as a rule, in children of from seven to fifteen years of age, and it is apparently occasionally absent in cases in which the squint has lasted a number of years. In the opinion of the writer, its presence is the principal cause of the maintenance of the deviation in the large majority of cases that have resisted the prolonged influence of their full correction.

If this opinion be correct, the treatment of this condition would seem to be a matter of vital importance, and, fortunately, we have at our command a means which is powerful and generally effective. There is no way in which we can so satisfactorily increase the power of divergence as by increasing the leverage by which it acts, and the result of advancing the insertion of both externi to the corneal margin in these cases is, at times, truly brilliant. Certainly

nothing can be more so than the re-establishment of binocular fixation for all points from infinity to three inches by a single operation, in a case of marked strabismus of long standing. And yet, as the result of his experience, the writer is persuaded that Landolt's operation should not be considered *per se* as an operation for convergent strabismus. He is disposed to regard it rather as an operation for insufficiency of divergence, and to believe that it is indicated only when this condition exists and that it can be expected with great certainty to cure the squint, when we can be reasonably sure that such an insufficiency is the sole impediment to the restoration of binocular fixation. For this reason it would seem to be contra-indicated in cases of periodic squint and in those in which the deviation is manifest only during near vision. Advancement of the externi in the latter class of cases produces a slight divergence for distance, which may later increase, and does not materially lessen, for some time at least, the convergent deviation for near points. This is what we might naturally expect to be the result, assuming that divergence and convergence are independent functions, and believing that an insufficiency of divergence is not present when the deviation is not manifest during distant vision. The same result is also possible if both recti be fully advanced, when the deviation during distant vision is very slight indeed. These are the only cases, apparently, in which one has to fear a resulting permanent divergence. In cases which present a marked secondary divergence insufficiency, whether the squint be of slight or of high degree, and the more certainly if it exceed ten degrees for distance, the operator may proceed with great confidence to advance both externi to the corneal margin. He should not be in the least alarmed at a marked divergence immediately succeeding the operation. This divergence is temporary, due entirely to the shortening of the muscles produced by the advancement of their insertions, and is compensated for by a slight recession of the globes, which ensues either immediately, when at the end of a week the bandage is removed and fixation is attempted by the patient, or somewhat later, when the effects of the atropine, employed during this

period, have disappeared. This statement applies apparently to cases in which there is a considerable degree of disparity in the acuteness of vision of the two eyes, as well as to those in which the vision is more nearly equal. In this connection, it may be further stated that while good vision of the squinting eye is of inestimable service in securing a good result from this operation, a quite well-marked amblyopia is not necessarily a bar to its successful performance. Crossed diplopia is the rule on the removal of the bandage, even in the latter class of cases, when the vision of the squinting eye is not less than $\frac{20}{200}$ as opposed to $\frac{20}{20}$ in the eye that fixates, and binocular fixation can be obtained and maintained, during distant vision at least, when the disparity is not greater than this. Some of these maintain binocular fixation for near points as well, and readily recognize the double images produced at distance by a vertical prism, when tested months after the operation. Such eyes may be considered as possessing a certain degree of binocular single vision, for large distant objects at least, which it may be reasonable to hope is sufficient to insure the permanency of the result. At any rate, they are very much in the same condition as the eyes of persons whose refraction we frequently have occasion to examine, in which, although the eyes are hypermetropic and one amblyopic, strabismus has never been present. Obviously all persons do not abandon binocular single vision under the same degree of provocation. As has been stated, we need not fear a permanent divergence in cases in which the divergence function was markedly deficient before the operation, unless indeed we excise so much of the tendons as to permanently anchor one eye in a divergent position. Apparently a person with a diverging power equal to three metre angles, or a twenty-one-degree prism can, generally speaking, maintain binocular fixation without discomfort, provided his refractive errors be corrected and his converging power be not deficient, and this amount in the writer's experience seems to be the greatest that can be given by a double advancement in cases in which the divergence was previously inadequate. Most cases of divergent strabismus are unquestionably due

primarily to an insufficiency of convergence, and the convergence function is in no way affected by this operation. A small number of cases of divergent strabismus, however, notably some of those that are associated with hypermetropia, do seem to present essentially, as their primary muscular anomaly, an excess of diverging power, their power of convergence being normal, or nearly so. These cases are, comparatively speaking, rare. Possibly it may be said that they will become more frequent as advancements of the externi for convergent strabismus become more common. This the writer believes will not be the case, for, as already stated, the greatest amount of divergence power that he has been able to produce has been equal to a twenty-degree prism, and ordinarily a few degrees in excess of the normal will be all that will be found, in cases in which the strength of the divergence function can be tested.

It does seem, however, that there is one other condition which is sometimes found after this operation and which might cause subsequent divergence. This is a hyperphoria, which may equal as much as four degrees. Whether in all cases, it exists before the operation as a slight vertical deviation, or results in some cases directly from the operation itself on account of defective technique, is a question exceedingly difficult to answer. At all events, those who have had most experience with latent anomalies seem to be fairly well agreed that such an amount of hyperphoria is capable of causing an insufficiency of convergence, which might in turn result in divergent squint. On this account it would seem, perhaps, logical to seek to remedy it by subsequent operation, when it is present in high degree. The writer would strongly advocate that all cases should be submitted to a course of treatment by their full correction for at least some months before operation is attempted. This aids us materially in making our diagnosis of a divergence insufficiency, may enable us to be more certain that it is practically the only lesion remaining that requires attention, and, furthermore, renders a course of atropine after the operation either unnecessary or necessary only for a short period. In children who have never worn glasses, one may of course oper-

ate immediately after testing, when the external rotations are markedly restricted, and this can frequently be done with good results, but the writer thinks that we are not only running considerable risk of being in error in our premises by so doing, but that we are also apt to prejudice our result unfavorably by not waiting until the spasm of convergence has been diminished. In such cases, the spasm of convergence is apt to persist for some time after the externi are advanced, and although a subsequent course of atropine aided by the full correction will frequently restore parallelism, which does not disappear after the atropine is discontinued, it is disappointing to the operator to have the patient leave the hospital with his eyes markedly converging. Furthermore if, as the writer believes, the deviation is responsible in the beginning for the secondary insufficiency of divergence, it certainly can do the divergence function no good to have the deviation continue for some weeks, at a time when the divergence function is, as it were, struggling to regain its lost power. In regard to those cases of convergent strabismus in which the external rotations are not restricted, it would seem probable that, for the most part, they do not present the best indications for treatment by this method. They seem to be comparatively rare in subjects of seven years and over, and if we are to consider them as consisting purely of an undiminishable convergence excess, they would seem theoretically to be better adapted for tenotomies of the interni. Certainly, the writer would not care again to advance the externi in such cases when, upon dissection, these muscles were found to be broad and fleshy. The existence of this class of cases may possibly explain the fact that one occasionally sees a person whose eyes, years after the performance of a single or double tenotomy, will manifest no tendency to divergence and will maintain binocular fixation for distance and near, even while continuing to wear a full correction, the operator having been fortunate enough to produce a cure of the deviation without reducing the power of convergence below normal limits. The writer believes that this is at least a possible explanation, and, while strongly advocating the advancement of the externi as the primary procedure in the treatment

of convergent strabismus, he would suggest that the existence of a secondary insufficiency of divergence is essential for the success of this operation.

The four following cases illustrate some of the conclusions drawn in this article:

CASE I.—Miss J. H., thirteen years, first seen at my office March 22, 1900. Convergent strabismus, 20°. Duration since early childhood. Fixates with left eye, V O D, $\frac{20}{70}$; V O S, $\frac{20}{40}$. Refraction under atropine, O D, $\frac{20}{30}$ w. + 3.75 sp. + 2.50 cyl. 90°; O S, $\frac{20}{20}$ w. + 4.25 sp. + 2. cyl. 90°. June 20, 1901: Had worn full correction continuously since last visit. Strabismus had been reduced to 12°. Rotations, O D, inward, 55° −; outward, 35° to 40°. O S, inward, 55°; outward, 40° −. June 27, 1901: Advanced both externi to corneal margin. Atropine was instilled for a week. Crossed diplopia on removal of bandage. The advancements seem to have altered the axes of the astigmatism and October 12th ordered O D, + 3.50 sp. + 2. cyl. 105° $\frac{20}{30}$ −; O S, + 3.50 sp. + 2. cyl. 75° $\frac{20}{20}$ −. External rotations, 50° R and L; internal rotation, 55°. Absolute fixation from infinity to three inches. Binocular single vision for distance; exophoria, 4°; hyperphoria, 3°. Overcomes 16° prism in abduction. Fuses stereoscopic images with ease. Up to the present time, however, does not habitually use both eyes for reading, alternately suppressing one image and can only occasionally read around a pencil.

CASE II.—J. F., thirteen years. First seen at Drs. Pomeroy and Hepburn's clinic, Manhattan Eye and Ear Hospital, in August, 1901. Convergent strabismus 38°, since early childhood. Fixates with right eye, V O D, $\frac{20}{30}$; O S, $\frac{20}{200}$. Refraction under atropine, O D, $\frac{20}{20}$ − w. + 2.75 sp. + 1.50 cyl. 180°; O S, $\frac{20}{30}$ with + 1. sp. + 3.50 cyl. 180°. Patient wore above correction for two months and when next examined the deviation had been reduced to 20°, returning immediately to 38°, when correction was removed. External rotations 35° R and L. Internal rotations 50° R and L. September 17th: Advanced both externi to corneal margin. October 13th: Binocular fixation and single vision for distance; vertical orthophoria; left hyperphoria, 4°. Overcomes a prism of 7° in abduction. There seemed, however, to be some residual convergence spasm with slight convergence for near points, and, as the vision in the right eye had fallen and atropine had been employed during this period, his eyes were

tested again and 1.25 D of additional hypermetropia was discovered in the right eye. The fuller correction was prescribed and October 28th atropine was discontinued. February 13, 1902: Binocular fixation and binocular single vision for all points in all directions from infinity to three inches. Reads around a pencil with ease. On the approach of the test object to a point closer than three inches, patient will either, as in normal subjects, maintain fixation with one eye, allowing the other to diverge and recognize the crossed diplopia; or, by a strong, voluntary effort, he will rotate one eye inwards and recognize the homonymous diplopia. He complains of no asthenopic symptoms. It is to be remarked that in cases of squint, cured by this method, the deviation does not return immediately upon the removal of the glasses.

Case III.—R. K., eleven years. First seen at my class at the German Poliklinik, January 10, 1901; illustrates what can be done in a case of marked amblyopia and also how, even in such an unfavorable case, a marked convergence spasm can be overcome by atropine subsequent to operation. This case was operated upon immediately after determining his refraction. Convergent squint of 20°, duration since an early age. Fixates with left eye, V O D, $\frac{6}{200}$; V O S, $\frac{20}{70}$. Atropine refraction. O D, $\frac{13}{200}$ with + 6. sp. + 2. cyl. 90°; O S, $\frac{20}{30}$ with + 6. sp. + 3. cyl. 90°. External rotations slightly under 40° R and L. Internal rotations 55° R and L. January 16, 1901: Advanced both externi to the corneal margin. January 23d, slight divergence and crossed diplopia. Atropine discontinued. One week later marked convergence. Atropine continued for three weeks, then discontinued with resulting apparent parallelism for distance and slight convergence for near points. Fixation cannot be accurately tested, for, on screening the fixing eye, the amblyopic eye, after moving in various directions in search of the candle, finally wanders to the external canthus and remains in this situation (excentric fixation). The result is, of course, purely cosmetic, and, from this view-point, excellent. The case has manifested no change in the past twelve months.

Case IV.—C. H., twenty-two years, from Drs. Pomeroy and Hepburn's clinic. First seen April 25, 1901. Had squinted since childhood and had never worn glasses, and yet the deviation for distance amounted to but 5°, while for near points it was pronounced. The external rotations equalled about 45° R and L. Fixation was maintained by the right eye. Under atropine,

V O D, = $\frac{20}{50}$ w. + 4.50 sp.; O S, $\frac{20}{100}$ w. + 4 sp. April 29th, advanced both externi to the corneal margin, without extending the extremities of the tendon vertically. A small piece of each tendon was excised. On removal of the bandage and discontinuance of the atropine, slight divergence was manifest for distance, and convergence still persisted for near points. This condition has continued to the present time (February, 1902), though, for some reason, the vision of the squinting eye has improved and is now $\frac{20}{40}$ — 1. Although the cosmetic effect is fairly good and the patient's appearance is improved, on account of the fact that the enophthalmus produced renders the deviation less marked, the existence of a divergence insufficiency in such a case is more than doubtful, and under such circumstances this operation seems to the writer to be unscientific.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE SECOND QUARTER OF THE YEAR 1901.

By Prof. ST. BERNHEIMER, at Innsbruck; Dr. O. BRECHT, Prof. R. GREEFF, Prof. C. HORSTMANN, and Dr. R. SCHWEIGGER, in Berlin;

with the assistance of

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Translated by Dr. Ward A. Holden.

Sections I.–III. Reviewed by Professor HORSTMANN

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

185. **Merkel** and **Kallius.** Macroscopic anatomy of the eye. *Graefe-Saemisch*, 2d ed., Leipsic, 1901. W. Engelmann.

186. **Ziebe** and **Axenfeld.** Resection of the sympathetic in glaucoma. *Samml. zwangl. Abh. a. d. Gebiete d. Augenheilk.* Edited by Vossius, iv., pts. 1–2. Halle, 1901. C. Marhold.

187. **Vossius.** On hemianopic reflex iridoplegia. *Ibid.*

Elschnig. Clinical reports. *Wiener med. Wochenschr.*, No. 13, 1901.

188. **Schirbach.** Statistics of injury of the eye. *Inaug. Dissert.*, Giessen, 1901.

189. **Hart, Schwarzkoff, Sigel.** A contribution to the statistics of blindness. From the Tübingen University eye clinic. Tübingen, 1901. F. Pretzcker.

190. **Osborne.** Ophthalmic reports from Egypt. *Arch. f. Augenheilk.*, xliv., 89.

The section on the macroscopic anatomy of the eye in *Graefe-Saemisch* has been worked over again by MERKEL with the assistance of KALLIUS (185) and now can be considered the most up-to-date and exhaustive treatise on the subject.

ZIEBE and AXENFELD (186) believe that the extirpation of the superior cervical ganglion or the resection of the sympathetic nerve can be accomplished without danger, since hitherto there has been but one death among 74 patients operated upon. By the operation an improvement is brought about lasting several months in some eyes, in others the progress of the glaucoma is checked, but one cannot determine beforehand whether the operation will be of service. In acute inflammatory glaucoma it is contra-indicated, except where iridectomy is refused, or where iridectomy on the other eye has not been successful. In hemorrhagic glaucoma it is a justifiable experiment. In chronic inflammatory and simple glaucoma a series of favorable results has been obtained. Resection therefore may supplement iridectomy in progressive cases; it is not to be done before iridectomy or sclerotomy has been tried. It is not yet ascertained whether the operation will prevent the development of glaucoma.

VOSSIUS (187) believes that Wernicke's hemianopic pupillary reaction really exists. He found it in a case in which the left eye became blind after a fracture of the base, while there was temporal hemianopsia on the right side. When light was thrown upon the nasal half of the right eye with a convex lens, concave mirror, or Kempner's apparatus, the right pupil remained fixed and there was no change in the left pupil. When, however, the light was thrown upon the centre or the temporal half of the right retina, the right pupil contracted directly and the left pupil consensually. (In a case of unilateral temporal hemianopsia with some reduction of central vision caused by fracture of the base, the translator invariably failed to elicit hemianopic pupillary reaction.)

SCHIRBACH (188) reports that among 32,219 patients, seen in 1890–1900, in the Giessen clinic, there were 3773 cases of injury, mostly among metal workers; 184 eyes were completely lost and blindness resulted in 34.

The paper by HART, SCHWARZKOFF, and SIGEL (189) contains a clinical statistical report on 4305 blind eyes seen in the Tübingen clinic. In 592 cases the blindness was of both eyes, in 3121 of one eye—2255 patients being men and 1458 women; 116

were born blind, 924 became blind in the first year of life, then the number decreased until the fifth year, becoming considerably greater in the sixth, and then decreasing in the seventh. In congenital cases, complicated cataract was the most frequent cause; in acquired cases, injury and various forms of keratitis. The number blind from blennorrhœa — 175 — is surprisingly small.

Osborne (190) treated in the Alexandria clinic 1947 house patients and made 141 extractions in a period of five years. He discusses the connection between epidemic Egyptian conjunctivitis and climatic conditions. The number of these cases begins to increase in the middle of April and reaches its maximum in August, falling to its minimum in February. Reports on the treatment of trachoma and various clinical subjects conclude the article.

II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

191. **Plaut** and **v. Zelewsky.** On the bacterial contents of the conjunctiva after extirpation of the lachrymal sac. *Klin. Monatsbl. f. Augenheilk.*, xxxix., p. 369.

192. **Bergmeister.** On congenital enophthalmus. *Beiträge zur Augenheilk.*, xlviii., p. 37.

193. **Birch-Hirschfeld.** Experimental investigations on the pathogenesis of methyl-alcohol amblyopia. *Graefe's Archiv*, lii., p. 356.

194. **Alexander.** Injuries of the eye from contusion. *Münch. med. Wochenschr.*, 1901.

195. **Weik.** On psychoses after eye operations. *Inaug. Dissert.*, Tübingen, 1901.

196. **Eisenberg.** On siderosis of the eye. *Ibid.*

197. **Asmus.** My experience with the sideroscope since the introduction of the electric street railways in Düsseldorf. *Klin. Monatsbl. f. Augenheilk.*, xxxix., p. 428.

198. **Dimmer.** Splinters of iron in the eye and their removal. *Wiener klin. Wochenschr.*, 1901, p. 643.

199. **Volkmann.** Tests of the attractive power of magnets. *Klin. Monatsbl. f. Augenheilk.*, xxxix., p. 447.

200. **Maklakoff.** The final results of my researches on the influence of voltaic light upon the skin. *Arch. d'opht.*, xxi., No. 5, p. 267.

201. **Pagenstecher.** The treatment of asthenopia. *Zeitschr. f. Augenheilk.*, v., p. 267.

202. **Campos.** The course of rays of light through a surface astigmatic from inequality of refraction in its principal meridians. Analytical study. *Arch. d'opht.*, xxi., 4, p. 206.

203. **Head** and **Campbell.** The pathology of herpes zoster and its bearing on sensory localization. *Brain*, No. 9, autumn, 1900.

204. **Callan.** Melanosarcoma of the eyeball, orbit, and liver. *N. Y. Eye and Ear Infirmary Reports*, Jan., 1901.

PLAUT and v. ZELEWSKY (191) have examined the conjunctiva for micro-organisms in 41 cases in which the lachrymal sac had been extirpated. In 30 of these cases the conjunctiva appeared healthy. In every case many bacteria were found. The xerosis bacillus was wanting in one case only, the staphylococcus albus was found 17 times, the staphylococcus aureus 6 times, and the pneumococcus once. Of other bacteria, they found the sarcina lutea 5 times, fungi twice, a pseudo-gonococcus 4 times, and the diplobacillus 3 times. From this it would appear that extirpation of the lachrymal sac enormously increases the number of bacteria present on the healthy conjunctiva. The virulence of the bacteria, however, is not increased. On the 11 diseased conjunctivæ the xerosis bacillus was found 9 times, the staphylococcus albus 5 times, the staphylococcus aureus 3 times, the pneumococcus 3 times, and the diplobacillus 6 times. Thus the prevention of the carrying off of the tears leads to a great increase in the bacteria of the conjunctival sac, but does not increase the danger of infection of the healthy conjunctiva.

BERGMEISTER (192) describes a case of congenital right-sided enophthalmus in a girl of eighteen. Mobility was limited. There were, furthermore, various anomalies of the right half of the face which he regarded as congenital. The ball was very small, the cornea abnormally curved, and there was a coloboma of the choroid and sheath of the optic nerve. Tenotomy of all four recti was done in the hope of improving the condition of enophthalmus, but this did little good, and the extent of the excursions remained as before.

BIRCH-HIRSCHFELD'S (193) experiments with methyl alcohol on rabbits and chickens showed that the first changes occur in the ganglion cells of the retina. Following this there may be degenerative changes in the optic nerves, involving only particular bundles. No evidences of inflammation are found in the nerve.

EISENBERG (196) reports that among fifty-three cases of injury with splinters of iron observed in the Giessen clinic, evidences of siderosis were manifest in fourteen. The foreign body lay almost always in the vitreous, and in all the vision was seriously damaged. In four cases a brownish discoloration of the cornea appeared, but never before the lapse of nine months. The iris was discolored in all cases, being greenish or brownish in color. With the excep-

tion of one case the lens was cloudy in all, but only in seven cases was a yellowish or brownish discoloration observed. In eight cases the vitreous contained opacities, in five there were chorio-retinitic changes, in five hemeralopia, and in three detachment of the retina.

VOLKMANN'S (199) experiments on the attracting power of magnets showed that with one third of the weight of the Haab magnet greater power might be obtained than with the Haab magnet.

After discussing accommodative, muscular, and conjunctival asthenopia PAGENSTECHER (201) states that he does not believe in correcting minor errors of refraction, but rather in treating conjunctival asthenopia by applying astringents to the cul-de-sacs. The so-called nervous asthenopia may be divided into three sorts, the first being characterized by great sensitiveness of the ball, the second by localized sensitiveness in the ciliary region, and the third by sensitiveness of the nerves emerging from the orbit. Massage of the ball and nerves is indicated. In mild cases he recommends the use of the "Pagenstecher Augenspiritus," which is rubbed on the forehead, temples, and lids. Cases of asthenopia dependent upon disease of the general nervous system resist all local treatment. Diseases of the nose and its neighboring cavities, of the throat, and of the teeth also cause asthenopia.

CAMPOS (202) discusses the passage of rays of light through astigmatic surfaces, starting from the action of prisms and reducing a system of two convex cylinders with axes perpendicular to four convex prisms. V. MITTELSTÄDT.

In the elaborate paper by HEAD and CAMPBELL (203), the disease is discussed in detail, and a portion of it deals with herpes of the trigeminal nerve. The authors have been fortunate enough to obtain a post-mortem examination on many of the patients who have died at varying intervals after the disease had attacked them. Their observations confirm those of Sattler, who found an inflammatory lesion with hemorrhage destroying both the nerve cells and fibres of the Gasserian ganglion.

In one of Head and Campbell's cases the patient died 190 days after the attack, and the Gasserian ganglion showed what appeared to be the remains of old hemorrhage with some destruction of the nerve cells in that portion corresponding to the nerve division. The root bundles of the affected ganglion showed an appearance that made it probable that a few of them were sclerosed, but there was no acute degeneration of any part

of the central nervous system referable to the lesion of the Gasserian ganglion. There was no noteworthy alteration in the ophthalmic division of the nerve peripheral to the ganglion. In another case death occurred thirty days after the outbreak of the eruption, which affected the third division.

In this, changes were found in the Gasserian ganglion and in the medulla. To sum up, the authors state that zoster of the branches of the trigeminal nerve is associated with a lesion of the Gasserian ganglion similar to that found in the posterior-root ganglion in zoster of the trunk and limbs. This lesion causes secondary degeneration in the sensory root of the Gasserian ganglion both in its intra- and extra-medullary course.

They look upon the disease as an acute specific one of the nervous system, and this is supported by the fact that it usually occurs in epidemics, and that a second attack is infinitely rare.

They discuss at length the nature of the lesion, but up to the present time no micro-organisms have been found to be the cause of it. MARSHALL.

CALLAN'S (204) patient, a woman of thirty-seven, struck the right eye with an oar. Two years later the vision began to fail. In one year the eye was enucleated for a tumor of the eyeball, which recurred in the orbit, skin of the chest, and liver, causing death. At the autopsy the liver was found of immense size (25.5 pounds). ALLING.

III.—INSTRUMENTS AND REMEDIES.

205. **Lilienfeld.** On the mydriatic effect of pilocarpine solutions. *Centralbl. f. prakt. Augenheilk.*, xxv., p. 120 and 145.

206. **De Wecker.** The introduction of jequirity into ophthalmic practice. *Graefe's Archiv*, lii., p. 566.

207. **Wolff.** Operations to increase the mobility of artificial eyes. *Therapie der Gegenwart*, April, 1901.

208. **Roure.** A double demi-lanceolate knife. *Ann. d'ocul.*, cxxv., p. 186.

209. **Landolt.** The reduced optotype chart. *Arch. d'opht.*, xxi., 6, p. 31.

210. **Haselberg.** A chart for detecting simulation of unilateral blindness and amblyopia. *Arch. f. Augenheilk.*, xliii., p. 214.

211. **Wicherkiewicz.** On the technic of iridectomy. *Centralbl. f. prakt. Augenheilk.*, xxv., p. 200.

212. **Javal.** On the testing of ophthalmometers. *Graefe's Archiv*, lii., p. 536.

LILIENFELD (205) observed after the instillation of pilocarpine at first a miosis reaching its maximum after an hour and a half.

After the pupil had regained its normal size a dilatation of the pupil occurred about thirty hours later. He attributes the latter action to faborin, which forms in the pilocarpine solution.

HASELBERG (210) has devised two charts with colored letters on a gray ground, on the principle that red letters on a white ground vanish when viewed through a red glass and appear black when viewed through a green glass. On the chart a green F has a lower red stroke making it an E, a green P becomes by the addition of a red stroke B, C becomes G, etc. When a green glass is held before the eye alleged to be blind and a red glass before the other, should the patient perceive the entire letter his simulation is unmasked.

WICHERKIEWICZ (211) uses a blunt silver hook to draw out the iris in iridectomy, in place of the usual forceps.

Sections IV.–VII. Reviewed by PROF. ST. BERNHEIMER, INNSBRUCK.

IV.—ANATOMY.

213. **Bernheimer.** The location of the centre for the sphincter. *Graefe's Archiv*, lii., p. 382.

BERNHEIMER (213) describes in detail his experiments on monkeys, which were described briefly at the Heidelberg meeting in 1900. By destruction of the right small-celled medial nucleus he obtained permanent right reflex iridoplegia. The clinical symptoms and the anatomical proof that, with the destruction of this nucleus, the oculomotor nucleus and the optic nerve remained intact, confirm his previous belief that the small-celled median nucleus in the oculomotor centre is doubtless the centre for the sphincter of the same side.

V.—PHYSIOLOGY.

214. **Markow.** Experiments with intermittent light-excitation of the retina. *Wjest. Ophth.*, 1901, Jan.–June.

215. **Tuyl.** Forward and backward movements of the eyeball under the influence of changing positions of the lids. *Graefe's Archiv*, lii., p. 233.

216. **Beer.** On primitive organs of vision. *Wiener klin. Wochenschr.*, xiv., p. 255.

217. **Richter.** The law of electrical excitation of the optic nerve as a sense organ. *Arch. f. Augenheilk.*, xliii., p. 67.

218. **v. Knies.** On the effect of excitation of short duration upon the organ of vision. *Zeitschr. f. Psych. u. Phys. d. Sinnesorgane*, 1901, p. 239.

219. **Pergens.** On factors influencing the recognition of test objects. *Arch. f. Augenheilk.*, xliii., p. 144.

220. **Elschnig.** On binocular perception of relief. *Graefe's Archiv*, lii., p. 294.

221. **Jackson, S.** Photography of the eye-ground. *Journ. Amer. Med. Assoc.*, June 1, 1901.

222. **Suter.** The dioptric power of the cornea. A reply to Dr. Weiland's criticism. *Ophth. Record*, April, 1901.

223. **Eldridge-Green.** Theory of light and color perception. *Edinburgh Med. Journ.*, April, 1901.

224. **Eldridge-Green.** Remarks on Holmgren's test. *Lancet*, April 13, 1901.

225. **Verhoeff.** The theory of the vicarious fovea erroneous. *Ophth. Record*, June, 1901.

MARKOW'S (214) investigations were made with the assistance of Braunstein's apparatus slightly modified. His purpose was to reconcile the conflicting results of the experiments made by other observers, and to determine the limit of retinal sensibility for intermittent excitation in the healthy eye in order to render this test of clinical value, and to furnish an analogy between the retinal reaction to intermittent light excitation and the reaction of motor and sensory nerves to intermittent electric excitation.

He found that the difference in luminosity between the bright test object and the dark ground influenced the result greatly. The greater the difference the more intense the excitation, and the greater the number of intermissions required. The sensibility of the retina to intermittent excitation is greater in the centre than at any other point and decreases toward the periphery, rather more rapidly to the nasal side of the field than the temporal. The centre of the retina, however, is more easily fatigued and more easily dazzled, and if adaptation is not perfect different results will be obtained. Wherever vision is diminished there is demonstrable a diminished sensibility to intermittent excitation, and this is more marked in disturbances of the perceptive apparatus than in opacities of the media. In states of hyperæmia of the eye the sensibility is increased. The author regards this as a valuable clinical test which may be used even with persons of little intelligence.

JACKSON'S (221) instrument is practically a self-illuminating ophthalmoscope with camera in the position of the eye of the observer. A reproduction of photographs, which are supposed to show a part of the fundus, is given. ALLING.

SUTER (222) maintains his original statement that the dioptric power of the cornea, which is a single refracting surface, cannot be represented by the power of a lens in air. He shows that the plane surface of a plano-convex lens modifies the refraction of the spherical surface for all rays which do not pass perpendicularly through the former. Such a lens is supposed by Dr. Weiland to represent the dioptric power of the cornea. ALLING.

This is an exhaustive paper on the author's (223) theory of color vision, the main points of which have been given in a paper read before the Ophthalmological Society of the United Kingdom in February and which appears in the report of that meeting. MARSHALL.

Mr. ELDRIDGE-GREEN (224) in this paper again draws attention to the inefficiency of Holmgren's test for detecting color blindness, citing the opinions of many ophthalmic surgeons who have found certain individuals perfectly able to match the wools and yet quite unable to tell a green light from a red one at night when some distance off, even in a clear atmosphere. He strongly urges a fresh inquiry into the subject. MARSHALL.

VERHOEFF (225), after the study of a case of convergent strabismus where the subjective tests showed orthophoria and the objective tests esophoria of 25°, concludes that binocular vision was not present and that no true eccentric fovea existed. He explains the phenomena by assuming a separate centre for binocular vision (in this case not present) apart from the individual centres for each eye. ALLING.

VI.—ANOMALIES OF REFRACTION AND ACCOMMODATION.

226. **Eckmann.** The abrupt cessation of a spasm of the ciliary muscle. *Ann. de la policlinique centr. de Bruxelles*, Jan., 1901.

227. **Jackson, E.** The amount of myopia corrected by removal of the crystalline lens. *Journ. Amer. Med. Assoc.*, March 16, 1901.

JACKSON (227) urges the more complete examination of eyes before and after operation in order that the effect of removal of the lens may be more thoroughly understood. Theoretically the amount of myopia of an eye that will be rendered emmetropic by removal of the lens will be: for myopia due to corneal curvature, 13 D.; for axial myopia, 26 D. From a collection of 296 cases it appears that for a given amount of myopia the effect may vary 10 D. or more. ALLING.

VII.—MUSCLES AND NERVES.

228. **Poulard.** Paralysis of associated movements of the eyes. *Arch. d'opht.*, xxi., 5, p. 255.

229. **Scrini.** Strabismus in the new-born. *Bull. de l'acad. de méd. de Paris*, April 30, 1901.

230. **Thompson, John.** Note on the peculiar nystagmus of spasmus nutans in infants. *Brit. Med. Journ.*, March 30, 1901.

231. **Fergus, Freeland.** An easy operation for congenital ptosis. *Ibid.*

232. **Duane.** What routine shall we adopt in examining eye-muscles. *N. Y. Med. Journ.*, May 25, 1901.

233. **De Schweinitz.** Concerning traumatic paralyses of the ocular muscles; with cases. *Amer. Jour. of Ophth.*, Nov., 1900.

234. **Cowen.** Hysterical paralyses of the ocular muscles. *N. Y. Eye and Ear Infirmary Reports*, Jan., 1901.

235. **Panas.** New statistics of the operation for concomitant strabismus. *Arch. d'opht.*, xxi., 6, p. 305.

Scrini (229) states that the appearance of strabismus, congenital or acquired early, has long been recognized. Of 136 infants examined within the first two weeks of life, 60 exhibited a periodic congenital squint. In 130 other infants between two weeks and three months old, a similar form of strabismus was found 35 times. Some of these cases recovered, while some remained as true convergent squints. In Pinard's clinic it was found that most of these infants were first-born, so that the duration of parturition may be one factor, although heredity, nervousness, ametropia, and hereditary syphilis are others.

v. Mittelstädt.

In his endeavor to obviate the scar produced by some of the operations, Fergus (231) has devised the following method of treating congenital ptosis: A horizontal linear incision is made along the whole length of the eyebrow. The skin is then separated upwards for about two inches from the underlying tendon and fascia of the occipito-frontalis muscle. The tissues are then separated from the tarsus and orbicularis muscle downwards as far as the margin of the lid.

A vertical band of the occipito-frontalis is then marked about one inch wide and two inches long, and this is dissected up from the deeper tissues until its only attachment is to the occipito-frontalis above. The end of the band is then drawn down into the upper eyelid and its margin secured by catgut sutures as near the margin of the lid as possible. The one and only skin wound is then closed, which, when the hair of the eyebrow has grown, is then quite invisible.

Marshall.

DUANE (232) regards the screen and parallax tests as the most reliable. These are respectively the objective and subjective deviation produced by alternately covering one eye and the other.

ALLING.

In most cases of head-shaking, or spasmus nutans, in young children there is nystagmus, which, however, differs from all other forms of nystagmus in the following manners, according to THOMPSON (230): When the movements are bilateral and horizontal, the eyes incline towards and away from each other so that there is convergent nystagmus, though in many cases the movements are so slight that they can hardly be made out with the unaided eye.

In those cases of spasmus nutans in which there is rotary nystagmus, this differs from the ordinary nystagmus of the same variety in that the eyes, instead of rotating round an antero-posterior axis, combine a movement of circumduction with it, so that the cornea passes through an ellipse or some more or less irregular rounded figure.

There are also some other differences; for example, in the form under consideration it is often unilateral instead of being very rarely so. It is often vertical or rotary instead of being nearly always horizontal. The direction of the movements, also, is occasionally different in the two eyes, that is, vertical or rotary in one eye and horizontal (at the same time) in the other, this state of things being never seen in ordinary nystagmus. Lastly, it is invariably recovered from in a certain number of months.

MARSHALL.

DE SCHWEINITZ (233) reports eight cases of traumatic paralysis of the ocular muscles. Case I. Tendon of the inferior rectus severed from its scleral attachments by a knife-thrust. Such accidents are extremely rare. The muscle was advanced and reattached to the sclera. Case II. Patient suffered from a large abscess of the orbit. The pulley of the superior oblique was loosely adherent to a fragment of carious bone which was detached. Later spontaneous disappearance of the diplopia. The tendon must have formed a new attachment. Case III. Injury of the superior oblique and superior rectus during an operation for the removal of a tumor of the orbit. Case IV. Paralysis of the right superior rectus following a blow on the right side of the head. Recovery. Case V. Paralysis of the left superior rectus and left levator palpebræ following a fall on the left side of the

head. Recovery. Lesion probably nuclear. Case VI. Traumatic paralysis of the right superior oblique following a blow on the right supraorbital region. Recovery. Case VII. Paresis of the left inferior rectus following a blow on the head, succeeded by concussion of the brain. Recovery. Case VIII. Paralysis of the left superior oblique following a blow on the head, succeeded by severe concussion of the brain. Recovery.

ALLING.

COWEN (234) presents a case of a young woman with complete paralysis of the muscles of the right eye. The patient recovered with the exception of paralysis of the internal rectus. Later periodic ptosis was present. The case was due to hysteria.

ALLING.

PANAS (235) publishes a new report of the results of his operation in 58 cases of convergent strabismus and 10 cases of divergent. Most of the patients were between the ages of five and twenty. He never operates on patients under five. Lately, in order to compare the effects obtained by double tenotomy after stretching, the latter has been omitted in a series of cases. He now finds that it is better not to do the stretching when the patient is of an age at which there is a tendency to spontaneous recovery. Over-correction is occasionally observed whether stretching is employed or not. The author believes that after the thirtieth year advancement is necessary as a rule in addition to double tenotomy. This is more likely to be the case in divergent strabismus.

V. MITTELSTÄDT.

Sections VIII.–XII. Reviewed by DR. R. SCHWEIGGER, BERLIN.

VIII.–LIDS.

236. **Schaefer, Hugo.** On molluscum contagiosum and its importance in ophthalmology. *Inaug. Dissert.*, Bonn, 1901.

237. **Blumenthal, L.** On the treatment of trichiasis of the lower lid. *Centralbl. f. prakt. Augenheilk.*, XXV., p. 139.

SCHAEFER (236) records six cases of molluscum contagiosum, stating that they are apt to keep up a conjunctivitis that resists treatment but recovers of itself after extirpation of the tumor. In two cases the writer saw irritation of the cornea evidently dependent upon the growths and relieved by their removal.

BLUMENTHAL (237) operates for trichiasis of the lower lid by splitting the intramarginal space and the tarsus from one end to the other, and then excising a flap of skin and muscle 2 *mm* from the free margin of the lid. The intratarsal and intramarginal cleft gradually fills up with granulation tissue.

IX.—LACHRYMAL APPARATUS.

238. **Stoewer.** A contribution to the pathology of the lachrymal gland. *Münch. med. Wochenschr.*, 1905, No. 5.

239. **Schoute.** Supernumerary lachrymal canaliculus. *Arch. d'opht.*, xxi., 6, p. 320.

240. **Günsburg.** Actinomycosis of the superior canaliculus. *Medic. Oborrenie*, May, 1901.

241. **Schoeffels.** On destruction of the lachrymal sac and its significance for the practitioner as compared with extirpation. *Klin. Monatsbl. f. Augenheilk.*, xxxix., p. 275.

242. **Passow.** On the surgical treatment of stricture of the nasal duct. *Münch. med. Wochenschr.*, 1901, No. 36.

STOEWER (238) gives a résumé of our knowledge in regard to the pathology of the lachrymal gland, and reports a case of dacryops, and also a case in which all four lachrymal glands were involved in an acute inflammation. As in most cases of this sort, no etiology was discoverable. The ducts were normal, so that the trouble could not have proceeded from the conjunctiva, but the neighborhood of the gland was inflamed, and it was supposed that infection had taken place through the medium of the blood.

GÜNSBURG (240) removed from the upper canaliculus a large concrement in which microscopically fungi were discovered. This case is the thirty-ninth reported case of concrement in the canaliculus, the eleventh in which actinomyces was discovered, the tenth in which the upper canaliculus had been occluded, and the seventh in the Russian literature.

HIRSCHMANN.

In dacryocystoblennorrhœa, SCHOEFFELS (241) in many cases prefers the obliteration of the sac with Vienna paste in accordance with Pagenstecher's method. A strong Weber knife is passed through the canaliculi downward as far as possible, and the internal ligament is severed. After the bleeding is checked, the wound is held open with retractors, and a pledget of cotton, covered with the paste, is introduced and replaced two minutes later by a tampon, which is renewed daily for two weeks. The entire operation is performed in ten or fifteen minutes under local

anæsthesia, and the patient is allowed to go home. The subsequent chemosis and œdema are treated with ice, and the throwing off of the remnant of mucosa is facilitated by the use of hot applications. If the cauterization is carried high up, the caruncle may partly disappear, and the palpebral fissure become narrowed. Otherwise there is no outward sign that an operation has been done. The cauterization is contra-indicated when the bone is affected, but in other cases it has the advantages of being done without a general anæsthetic, of being of short duration, of causing little bleeding and but slight cicatrization, and of requiring no assistant.

Passow (242) removes the lower turbinate and, with the aid of a chisel, as much of the crista turbinalis of the superior maxilla and of the lachrymal bone as is necessary to lay free the nasal duct up to the sac, which he then splits from below with a probe-pointed crescentic knife. In this manner he successfully treats epiphora.

X.—ORBIT AND NEIGHBORING CAVITIES.

243. **Morax.** Semeiology of orbital hemorrhage à propos of a spontaneous orbital hemorrhage. *Ann. d'ocul.*, cxxv., p. 274.

244. **Hahn.** On orbital hemorrhages in cases of hæmophilia. *Inaug. Dissert.*, Tübingen, 1900.

245. **Günsburg.** On the pathogenesis of serous orbital cysts. *Wjest. Ophth.*, May–June, 1901.

246. **Du Castel.** Syphilis of the face; exophthalmus. *Bull. de la soc. de dermatol. et de syph. de Paris*, Feb. 7, 1901.

247. **Walitzki.** On a case of Basedow's disease in a boy of five. *Gesellsch. d. Kinderaerzte*, Moscow, Jan. 1, 1901. *Allg. med. Centralzeitung*, 1901, p. 893.

248. **Whitehead.** A case of cavernous angioma of the orbit. *Brit. Med. Journ.*, April 13, 1901.

249. **Alt.** A case of myo-fibro-sarcoma of the orbit. *Amer. Journ. of Ophth.*, March, 1901.

250. **Borsch.** The closed artificial eye. *Ophth. Record*, May, 1901.

251. **Harlan, G. C.** Abscess of the orbit from disease of the ethmoid. Curetting through the orbit, and draining through the nose. *Phil. Med. Journ.*, May 11, 1901.

252. **Weymann.** Some technical supplements in complicated enucleations. *Journ. Amer. Med. Assoc.*, April 13, 1901.

In Du Castel's (246) patient, a boy of nine with hereditary syphilis, there appeared, ostensibly after an injury, ulceration of the skin of the cheek and nose, followed by keloid-like cicatrization. At the age of eleven most of his teeth fell out in the course

of two months. Following this there was caries of the supporting framework of the nose leading to the familiar deformity of the nose, and finally right-sided exophthalmus, probably due to the extension of the disease from the nasal cavity to the sinus and orbit. Improvement followed repeated injections of calomel.

BERGER.

WALITZKI's (247) patient, a boy of five, had been affected for three months with exophthalmus, goitre, asthma, etc. The internal administration of arsenic and galvanization of the sympathetic soon led to general improvement and lessening of the exophthalmus.

WHITEHEAD's (248) patient was a man aged fifty-one, whose right eye was so proptosed that the lids could not be shut and the cornea was ulcerated by exposure. On separating the lids the tumor could be seen above the globe. There was no pulsation and the vision was $\frac{6}{60}$. The proptosis had first been noticed ten years before and had gradually increased since then. The outer canthus was split and the external rectus carefully divided. The tumor was removed *en masse* without injury to the eyeball, and then the cut muscle was carefully sutured and the wound closed. The patient recovered with vision of $\frac{6}{9}$ and with good movement of the eyeball.

The growth consisted of three main lobes each of which was covered with a thin fibrous capsule and microscopically it was seen to be a cavernous angioma of the fibrous variety.

MARSHALL.

ALT's (249) case presented a round, smooth tumor behind the lachrymal sac and immovably connected with the periosteum. The mass, which on removal was about the size of a walnut, was undoubtedly sarcomatous in character. The muscular coat of most of the blood-vessels was thickened and muscular fibres were seen growing in the surrounding tissue. ALLING.

BORSCH (250) obtains a better-fitting eye by forming a hollow closed shell. ALLING.

WEYMANN (252) suggests suturing a collapsed eyeball and injecting salt solution or paraffin quite hot, to facilitate enucleation. ALLING.

XI.—CONJUNCTIVA.

253. **Koster.** A case of conjunctivitis petrificans. *Neder. Tydschr. v. Geneesk.*, 1901, I, No. 22.

254. **Rymowitsch.** On the pathogenesis of conjunctivitis due to the diplobacillus and on its biology. Reprint from the *Russisch. Archiv f. Path., klin. Med. u. Bacteriol.*, St. Petersburg, 1901.

255. **Plaut** and **v. Zelewsky.** On the bacterial contents of the conjunctival sac after extirpation of the lachrymal sac. *Zehender's klin. Monatsbl.* xxxix., v., p. 369.

256. **Schanz.** On the etiology of ophthalmia neonatorum. *Zeitschr. f. Augenheilk.*, vol. vi., p. 436.

257. **Smith, W. H.** Ophthalmia neonatorum. *Ned. Tydschr. v. Geneesk.*, 1901, I, No. 19.

258. **Falta.** The treatment of trachoma with ichthargan. *Arch. f. Augenheilk.*, xliii., p. 124.

259. **Levy.** A contribution to the spontaneous recovery and to the clinical picture of conjunctival tuberculosis. *Klin. Monatsbl. f. Augenheilk.*, xxxix., p. 386.

260. **Pergens.** Pemphigus of the eye. Berlin, 1901.

261. **Hanke.** Herpes iris of the eye. *Graefe's Archiv*, lii., p. 263.

262. **Haarland.** On transplantation of the conjunctiva. *Inaug. Dissert.*, Tübingen, 1901.

263. **Handmann.** On a primary cavernous angioma of the conjunctiva. *Klin. Monatsbl. f. Augenheilk.*, xxxix., 5, p. 379.

264. **Beard.** A case of unilateral œdema of the conjunctiva. *Medical Press and Circular*, April 17, 1901.

265. **Alt.** Blennorrhœa neonatorum. *Amer. Journ. of Ophth.*, April 1, 1901.

266. **Wylie, Ella R.** Parinaud's conjunctivitis. *Ophth. Record*, June, 1901.

KOSTER's (253) patient, a man of twenty-one, who had suffered from repeated scrofulous keratitis, showed on the bulbar conjunctiva a small, round chalky white spot with a smooth surface, 8 *mm* in diameter. Removed and examined microscopically it was found to be chalky. Koster alludes to the possibility of the affection being tuberculous although no bacilli were found.

ZITTA.

Among 116 cases of conjunctivitis RYMOWITSCH (254) found the Morax-Axenfeld diplobacillus in 33 or 28.4 %. Apart from the acute cases due to the Weeks bacillus and from eczematous inflammations, the diplobacillus was found in 52 % of cases. These mostly were not acute and there was mucous secretion.

The inflammation is most marked at the inner commissure, the plica semilunaris, and the caruncle; it has no tendency to heal spontaneously. Cultures of the diplobacillus produce the disease on the healthy conjunctiva in four days. Introduced into the anterior chamber of the rabbit it causes an intense plastic iritis. A solution of zinc soon cures the disease. HIRSCHMANN.

PLAUT and v. ZELEWSKY (255) find from clinical observations that the danger of septic infection from the conjunctiva after extirpation of the lachrymal sac is practically nil. They examined forty conjunctivas after extirpation of the lachrymal sac, thirty of these being apparently healthy. All thirty exhibited more bacteria than are present normally, but they were not of a virulent nature. The bactericidal action of the tears, which in these cases accumulate in the conjunctival sac, appears to the writers to be overestimated, and for some bacteria, such as the xerosis bacillus, seems indeed not to exist.

SMITH (257) has made investigations in regard to the concentration in which nitrate of silver and permanganate of potassium can be used in the eye without endangering the cornea, and he has compared the bactericidal effect of the two agents. His conclusions are: 1. When the entire conjunctival sac is to be washed out without nitrate of silver, no stronger solution than 1:500 should be used. 2. The bactericidal action of nitrate of silver, our best anæsthetic, far surpasses that of permanganate of potassium. 3. The negative result of investigations as to antiseptic action of the permanganate makes it seem probable that the favorable effect of this agent in the treatment of blennorrhœa is due to the mechanical cleansing. ZITTA.

FALTA (258) uses a 1.5–3 % solution of ichthargan in trachoma and obtains improvement in all stages of trachoma, and particularly pannus.

LEVY'S (259) three-year-old patient, seen in Axenfeld's clinic, had suppurating tuberculous glands beneath the lower jaw and suddenly developed a severe inflammation of the conjunctiva of the lower lid with an adherent whitish pseudo-membrane and moderate suppuration. The upper lid was but slightly altered and the eye otherwise was intact. After three weeks the membrane gave place to a large ulcer of tuberculous appearance, about which were small yellowish nodules. No bacilli could be discovered, but inoculation in a rabbit's eye led to a positive result. Within two weeks the infiltration of the lid diminished, the ulcer cicatrized, and the nodules disappeared. No relapse a year later. The result was largely attributed to tonic treatment.

PERGENS (260) reports a new chronic and a new acute case of pemphigus. 1. A man of sixty-two had had the skin disease for years, the eye being occasionally affected, and, without the formation of vesicles, gradually became xerotic. Microscopically

nothing remarkable was found. 2. An infant under one year old became ill three weeks after the general eruption which involved the eyes, and died. One eye had panophthalmitis, following perforation of the cornea, staphylococci being found; the other eye had a vesicle on the cornea with a perforation beneath it. Microscopically the cornea was found to lack its epithelium and Bowman's membrane almost entirely and to be infiltrated with cells. The conjunctiva had a croupous membrane and in part a diphtheritic infiltration. Of the 112 non-syphilitic cases reported in the last decade the author makes four categories: 77 with cutaneous vesicles, 15 without cutaneous, but with vesicles of the mucous membranes, 2 with vesicles in the eye alone, and such as exhibited no vesicles and are to be regarded as essential shrinking.

Herpes circinatus and herpes iris, forms of erythema exsudativum multiforme, affect not only the skin, but often also the mucous membranes, particularly of the mouth and rarely of the conjunctiva also. It is conceded that the mucosa of the mouth may become affected alone, and HANKE (261) believes that the same isolated infection may occur in the conjunctiva. Usually there is little fever, few subjective symptoms, and lack of irritation and secretion from the conjunctiva, but there is marked œdema of the conjunctiva or lid. In severer cases there is a membranous inflammation of the tarsal and retrotarsal fold, to which may be added inflammation and ulceration of the cornea.

Hanke has seen several cases and made an anatomical examination of one case in which the conjunctiva was involved. In one eye of this patient the membrane formation was benign and the number of streptococci fewer than in the other eye. The writer believes that the streptococci were not answerable for the outbreak of the process, but for its greater malignity in the second eye. Although it is difficult to recognize isolated herpes iris of the eye, since the characteristic membranous formation presents a clinical picture that may have another etiology, yet the writer believes that these cases should be removed from the dark category of chronic membranous conjunctivitis by attention to the following points: peculiar benign course, lack of severe inflammatory symptoms and of subjective disturbances, and a jelly-like, loosely attached membrane.

HAARLAND (262) states that in the Tübingen clinic cases with an unfavorable prognosis are subjected to transplantation of the cornea. He cites two cases of infected injury of the cornea suc-

cessfully treated by this method, but in several the results were not good and vision was lost from ulceration. Some of these cases he believes were operated upon too late.

HANDMANN (263) reports that a rapidly growing tumor appeared in the region of the plica semilunaris of a girl of ten. A portion was excised and found to be an angioma. Electrolysis failed to check it and in three weeks the entire bulbar conjunctiva was involved and the cornea surrounded by a thick bluish-red tumor. The retrotarsal folds also were involved, but the lids remained free. Enucleation had to be performed. Microscopic examination showed that the entire tumor was a pure angioma.

BEARD (264) describes a case of unilateral œdema of the conjunctiva occurring in a patient the subject of chronic lead poisoning. For this he was treated and greatly improved. He then suddenly developed œdema of the conjunctiva (ocular) and so great was it that it protruded through the lids and entirely occluded the eye. There was a depression in the centre, at the bottom of which was the cornea. It was treated with boracic lotion for three days without effect, and then a leech was applied to the temple and in thirty hours it had quite subsided. The author considers that it was really a gouty manifestation.

MARSHALL.

In the microscopical examination of the pus in seventeen cases of blennorrhœa neonatorum, ALT (265) found the gonococcus of Neisser in only nine. ALLING.

XII.—CORNEA.

267. **Fuchs.** On marginal sclerosis and marginal atrophy of the cornea. *Graefe's Archiv*, lii., p. 317.

268. **Takayasu.** A contribution to the pathological anatomy of arcus senilis. *Arch. f. Augenheilk.*, xliii., p. 154.

269. **Schieck.** On cystic formation on the surface of the cornea. *Graefe's Archiv*, lii., p. 285.

270. **Dimmer.** On opacity of the cornea due to folds after parenchymatous keratitis. *Zeitschr. f. Augenheilk.*, v., 4, p. 251.

271. **Schaeler.** On the question of erosions of the cornea. *Centralbl. f. Augenheilk.*, xxv., p. 161.

272. **Baer.** The treatment of keratomalacia in infants. *Klin. Monatsbl. f. Augenheilk.*, xxxix., p. 287.

273. **Stasinsky.** The treatment of ulcus serpens. *Therap. d. Gegenwart*, May, 1901.

274. **Levy, Simon.** The treatment of corneal staphyloma. *Inaug. Dissert.*, Giessen, 1901.

275. **Jocqs.** Phlegmon of the eye consecutive to total staphyloma of the cornea following ophthalmia neonatorum. *La clin. opht.*, 1901, p. 146.

276. **Roche.** A case of papilloma of the corneal limbus. *Ann. d'ocul.*, cxxv., p. 267.

277. **Weymann.** A case of non-comitant ribbon-like keratitis, with remarks, *Ophth. Record*, April, 1901.

Fuchs (267) studied arcus senilis and analogous conditions similar in appearance to the residues of marginal catarrhal corneal ulcers. He has seen cases in which the arcus extended far toward the centre of the cornea. These processes take place near the surface of the cornea, and consist in depositions in Bowman's membrane of hyalin in one case and of chalk in the other. A slowing of the lymph circulation may allow insoluble chemical substances like hyalin to be precipitated. The hyaline deposits producing arcus often extend toward the centre of the cornea while the periphery clears up again.

Takayasu (268) examined twenty eyes with reference to arcus senilis. When no arcus was visible in old people, usually no microscopic evidence of it could be found, but it often was well marked when it appeared very faint to simple inspection. With the aid of the new delicate reaction for fat, staining with sudan, the arcus revealed itself as an extensive degeneration of the corneal substance into fine fat globules, as Virchow announced. The globules in the cornea take the osmic-acid stain poorly and other stains not at all, while in absolute alcohol they disappear without leaving a trace. Sections stained with ordinary nuclear stains exhibit neither fat globules nor hyaline deposits (Fuchs) nor chalk (Leber).

Schieck (269) examined the eyeball which presented on the upper half of the cornea a trilocular cyst 20 *mm* long and 9 *mm* broad. It was lined with pavement epithelium and covered with conjunctival epithelium beneath which there was no Bowman's membrane. In the cyst wall were some corneal lamellæ. The iris was adherent to the cornea. The patient had had, a year before, a blennorrhœa with prolapse of the iris and marked chemosis, which overlay two fifths of the cornea and was repeatedly incised.

The author believes that a doubled fold of conjunctiva was transplanted upon the cornea.

Dimmer (270) distinguishes two sorts of stripes in parenchymatous keratitis: 1, the gray stripes seen in the course of a florid

keratitis, which disappear later; and 2, the striped opacities which appear late in the disease and remain permanently. The latter are due to wrinkling of Descemet's membrane from œdema of the cornea or diminished tension. The author thinks that cloudy liquid or cellular infiltration in preformed passages, such as the nerve canals, may also produce the picture.

SCHAELER (271) cannot confirm the statement that the pain from erosions of the cornea comes on only after the patient wakes. In some cases the pain appears with sudden movement of the eye, and in others when the lids are rubbed. The author recommends a peculiar treatment which has been tried thoroughly. After cocaine anæsthesia the cornea is pencilled with dilute chlorine water. This causes the epithelium to be cast off for some distance about a fresh erosion, which is a sign of disease, since the epithelium of the uninjured, unchanged cornea cannot be pencilled off in this way. Atropine salve and applications of chlorine water are made for about three days when no epithelial defect and no opacity of the cornea can be discovered.

BAER (272) in cases of keratomalacia in marasmic infants has the patient fed on milk and water, equal parts, to which lime-water is added. The patients soon improve, and the eyes require no further treatment.

STASINSKY (273) scrapes serpent ulcers with a sharp spoon, or if there is danger of perforation he applies tincture of iodine. Then he rubs in airol powder which adheres to the ulcer and presents fresh infection. In order to clear up the corneal infiltration and the hypopyon, he injects subconjunctivally a mixture of salt, atropine, and cocaine, which may be repeated twenty-four hours later. Warm fomentations are applied four times in the interval. Later airol and atropine are instilled or used in the form of powder or salve. Among thirty cases only one was not improved by this treatment.

LEVY (274) regards staphyloma of the cornea as a condition not only unpleasant but also dangerous, because a fresh irritation of the scar from the perforation of the cornea that caused the staphyloma may give rise to sympathetic disturbance in the second eye. Iridectomies made to prevent or remove a staphyloma or for optical purposes were unsuccessful in one half the cases. The author prefers Beer's conservative method of treatment to enucleation or evisceration and to Critchett's method which repeatedly has led to sympathetic ophthalmia.

Under the above title WEYMANN (277) seeks to classify those cases of ribbon-like keratitis which are not accompanied by other lesions of the eye. Such is mostly the case in the aged. A microscopical examination of the case reported showed the presence of lime salts below a desiccated mass of hypertrophied epithelium, Bowman's membrane being replaced by dense connective tissue. In the treatment, dissection is much to be preferred to scraping. ALLING.

Sections XIII.–XVIII. Reviewed by DR. O. BRECHT, BERLIN.

XIII.—LENS.

278. **Peters.** Further contributions to the pathology of the lens. *Klin. Monatsbl. f. Augenheilk.*, xxxix., p. 337.

279. **Fröhlich.** On the open treatment of the wound after extraction. *Ibid.*, p. 257.

280. **Terrien.** Cataract operation. *Arch. d'opht.*, xxi., 6, p. 323.

281. **Terrien.** On a particular indication for combined extraction. *Ibid.*, 4, p. 214.

282. **Hirschberg.** The operation for sympathetic soft cataract. *Centralbl. f. prakt. Augenheilk.*, xxv., p. 109.

283. **Plehn.** On a cataract section in two planes. *Zeitschr. f. Augenheilk.*, v., p. 259.

284. **Meller.** On spontaneous bursting of the lens capsule and expulsion of the nucleus from the eye. *Beitr. z. Augenheilk.*, 47, p. 73.

285. **Fréyières.** A contribution to the study of traumatic cataract. *Thesis*, Toulouse, 1900.

286. **Fernandez.** Iridectomy after simple extraction. *Report 3d Pan-American Congress*, Havana.

287. **Wassilieff.** The pathological changes in the eye following luxation of the lens into the vitreous, with reference to the question of couching. *Wjest. ophth.*, May–June, 1901.

288. **Tojoanio.** Cataracts which should not be operated upon in the young. *Thesis*, Lyon, 1900.

289. **Koslowski.** On simple extraction. *Wjest. ophth.*, 1901, No. 3.

290. **Bodeewes.** A statistical contribution to the subject of traumatic luxation of the lens. *Inaug. Dissert.*, Giessen, 1901.

291. **Aubaret.** A case of traumatic luxation of the crystalline lens beneath he conjunctiva. *Gaz. hebdom. d. sciences méd.*, No. 1, 1901.

292. **Le Page.** Persistence of the pupillary membrane and congenital pigmentation of the anterior surface of the lens. *Thesis*, Paris, 1901.

293. **Mendel.** Cataract operation in a case of congenital irideremia. *Centralbl. f. prakt. Augenheilk.*, xxv., p. 173.

In an extensive paper, consisting of a clinico-anatomical and an experimental part, PETERS (278) develops his present view on the development of opacities of the lens. He started

from the condition found in a woman of twenty-four who died of chronic nephritis, there being also tetany and slight opacity of the lens. Here the pigment layer and the epithelium of the ciliary processes exhibited a hydropic swelling of the protoplasm. The author explains cataract as arising from anatomical changes in the epithelium of the ciliary body. He believes that this epithelium suffers in constitutional diseases and intoxications, and also in old age. The aqueous humor secreted by these cells will be chemically altered, particularly as regards its salt component. Increase of salt in the aqueous humor causes sclerosis and shrinking of the lens. Ingenious experiments have in fact demonstrated that in rabbits to which naphthalin has been given, the ciliary epithelium degenerates, the amount of salt in the aqueous increases, and the lens becomes opaque. By this hypothesis all forms of cataract may readily be explained, and particularly choroidal, traumatic, and diabetic cataract.

In the last two years FRÖHLICH (279) has employed open treatment of the wound after cataract extraction in fifty cases. After the operation, cotton is applied and held in place by strips of plaster, but after three or four hours this is exchanged for a binocular celluloid shield. In one case there was infection of the section, which, however, could not be attributed to the dressing.

TERRIEN (280) describes in detail extraction with and without iridectomy, giving many illustrations of the manipulation of the instrument in the various stages of the operation. He considers it important that the speculum used should be readily removable, so that if the patient is restless the operation may be concluded without speculum or fixation forceps. He grasps the ball near the middle of the inner margin of the cornea. The section — in his opinion the most important part of the operation — begins 1 *mm* above the horizontal diameter and includes the upper circumference of the cornea. The knife is passed quickly to the point of counterpuncture, then the handle is depressed, making the inner-upper portion of the section, then elevated, making the outer-upper portion, leaving only a little bridge above, which is divided slowly and without any sawing motion. The forceps are removed immediately after the discission, but the speculum remains usually until the end of the operation. Remains of cortex are removed by introducing particular spoons. After the conclusion of the operation a 2 % oily solution of eserine is instilled.

v. MITTELSTÄDT.

HIRSCHBERG (282) reports a further case of good result in cataract extraction from the eye of a boy of seven with sympathetic ophthalmia. Vision was $_2\frac{1}{\infty}$. In narcosis extraction was done with a lance and forceps. Three months later an artificial pupil was made. Ten weeks later V = $\frac{1}{4}$.

PLEHN (283) suggests a new cataract knife and a new direction of the section in order to avoid prolapse of iris. At first the section lies parallel to the iris, and then the knife is turned at right angles. Schuleck reported in 1895 a similar section which he had made with a narrow Graefe knife in 135 cases without a single prolapse. Plehn reports a single case.

MELLER'S (284) observation concerned a patient with senile cataract, on whom an iridectomy was done for increased tension. A month later, without any injury pain suddenly came on and passed off after a few hours. The following day the scleral wound was found gaping, and the nucleus of the lens lay in the upper cul-de-sac. Anatomical examination showed that the capsule of the lens had ruptured at the equator, and the anterior capsule was found wrinkled up in an organized exudation.

The second observation concerned a patient of sixty-four with chronic inflammatory glaucoma. After a regular iridectomy portions of the lens and vitreous escaped. There had been no injury. Some weeks later the ball was enucleated on account of the continued pain. On section the capsule of the lens was found to be empty, and the equator rested on the posterior surface of the corneal scar, the rupture having occurred at the equator.

WASSILIEFF (287) couched 24 lenses in rabbits' eyes and examined the eyes anatomically from 19 to 160 days later. In the great majority of cases the lens rose into the pupillary region again, and in but six cases did it remain lying horizontal in the lower part of the eye. In all cases symptoms of irritation appeared, but usually disappeared within ten days. In other cases they continued as an iridocyclitis, and in three cases there was purulent iridocyclitis. In 21 of the 24 eyes pathological changes were found, such as (1) obliteration of the chamber angle in six cases, (2) inflammatory changes in the vascular tract in six cases, with involvement of the retina, and (3) detachment of the retina. In but three cases were there no pronounced changes manifest. The author believes that in man favorable results can be obtained only when the vitreous is not disturbed and the lens is forced

down between the hyaloid and retina, or in cases in which the vitreous is liquid. HIRSCHMANN.

KOSLOWSKI (289) compares his 966 extractions with iridectomy with his 456 simple extractions, and gives his preference to the latter, for with it he has had fewer losses and has obtained better vision. He has greatly reduced the number of prolapses by performing iridectomy at once when the iris had been injured or could not readily be replaced. HIRSCHMANN.

XIV. — IRIS.

294. **Kopetzky v. Rechtperg.** Circular sarcoma of the iris and ciliary body. *Graefe's Archiv*, liii., p. 330.

295. **De Schweinitz.** Rupture of the sphincter of the iris and V-shaped rupture of the choroid on the nasal side from contusion of the eyeball. *Ophth. Rec.*, May, 1901.

296. **Mittendorf.** Tuberculosis of the iris. *Med. News*, May 25, 1901.

KOPETZKY V. RECHTPERG (294) describes a flat sarcoma (pigmented spindle cells) of the iris and ciliary body which had existed for twelve years without causing any disturbance or change of form in the iris.

MITTENDORF (296) distinguishes three forms of tuberculosis of the iris. The first class comprises those cases usually connected with tuberculous disease of the general system. It assumes an acute form at once. It resembles rheumatic or specific iritis, but with the presence of grayish nodules. Another form of the disease runs a much slower course. The isolated yellowish nodules remain for a long time, but may eventually disappear. The third form is the most serious and manifests itself as a single tuberculous deposit in the bottom of the anterior chamber. This, as a rule, by its extension, leads to the destruction of the eye. He gives three cases illustrating these forms of the disease. ALLING.

XV. — CHOROID.

297. **Augstein.** On the question of detachment of the choroid after cataract and glaucoma operations. *Zeitschr. f. Augenheilk.*, v., p. 268.

298. **Lagrange.** Pathological anatomy of melanotic sarcoma of the uveal tract. *Arch. d'opht.*, xxi., 4, p. 177.

299. **Dixon.** A case of injury resulting in a peculiar bone formation in the ciliary region. *N. Y. Eye and Ear Infirmary Reports*, Jan., 1901.

300. **Carpenter.** Purulent choroiditis following an attack of mumps. Diagnosis: metastatic choroiditis, revised by study of the enucleated eyeball. *Phil. Med. Journ.*, May 11, 1901.

AUGSTEIN (297) reports three cases of detachment of the choroid, and argues against Fuchs's view that the detachment is due to the entrance of aqueous humor through a tear in the ciliary body into the suprachoroidal space. In two cases of cataract extraction with posterior sclerotomy for hemorrhagic glaucoma he observed detachment of the choroid. It had, however, always a grayish-blue color, the anterior chamber was never shallow, and the tension never below normal. The author, therefore, concludes that Fuchs's theory will not fit all cases, and suggests in explanation of his cases Marshall's idea of an active serous exudation beneath the choroid.

LAGRANGE'S (298) paper is an extract from his treatise on the tumors of the eye which appeared recently and takes up the microscopic anatomy of melanosarcoma, special attention being given to the matter of pigmentation. As regards the origin of the pigment he believes that microchemical reactions do not permit us with accuracy to distinguish hæmatogenous pigment from that arising in the cells themselves. The hæmatogenous pigment is found particularly near the vessels, the autochthonous scattered through the tumor. He believes that the pigment arises chiefly from the normal cells of the choroid, although the blood also plays a considerable rôle. Tumors with hæmatogenous pigment appear to be less malignant than the others. V. MITTELSTÄDT.

DIXON (299) found a pedunculated, lamellated mass behind the ciliary body in an eye which had been removed for traumatic cyclitis. It presented the appearances of pathological decalcified bone. ALLING.

CARPENTER (300) discovered a piece of steel in the enucleated eye. ALLING.

XVI. — VITREOUS.

301. **De Schweinitz.** Blood-vessel formation in the vitreous. *Ophth. Record*, iii., p. 1.

302. **Silcock.** Vestigial hyaloid artery starting from a macular coloboma. *Trans. Ophth. Soc. Un. K. 1900*, p. 188.

XVII. — GLAUCOMA.

303. **Blessig.** The alternating appearance of glaucoma simplex and retinitis pigmentosa in children of one family. *Petersb. med. Wochenschr.*, xxvi., No. 9, p. 105.

304. **Gatzsk.** A contribution to the treatment of glaucoma with particular reference to iridectomy. *Inaug. Dissert.*, Breslau, 1901.

305. **Golowin.** Optico-ciliary neurectomy in absolute glaucoma. *Zeitschr. f. Augenheilk.*, v., p. 414.

306. **Mullen.** Resection of the cervical sympathetic for non-inflammatory glaucoma. *Arch. de optal. hispano-americ.*, 1901.

307. **Veasey.** Restoration of useful vision in a complicated case of acute inflammatory glaucoma of ten days' duration with visual acuity reduced to perception of light. *Med. News*, May 11, 1901.

In a family of nine children of healthy parentage BLESSIG (303) found that the eldest daughter had glaucoma simplex, the second child (male) retinitis pigmentosa and deafness, the third and fourth children (females) had normal eyes; the fifth child (female) was deaf, and between the ages of thirty and forty acquired glaucoma simplex in the left eye and at the age of fifty-nine in the right. The sixth child (male) was deaf and had retinitis pigmentosa; the seventh (female) and the eighth (male) child had never had any eye trouble. The ninth child (female) was deaf, had headaches, and suffered from retinitis pigmentosa. The parents were not related and never had trouble with their eyes, but the paternal grandfather was blind in old age. The alternate appearance of glaucoma and retinitis pigmentosa in members of a family and the fact that these two affections have frequently been observed in the same person suggests a common cause. The author believes this cause to lie in an hereditary affection of the vascular system. Among the numerous children of the four married members of this family (two males with affected eyes and two healthy females) who now have arrived at middle age no eye disease has been observed. HIRSCHMANN.

GOLOWIN (305) discusses his experiences with optico-ciliary neurectomy in absolute glaucoma. He operates from the temporal side, splitting the outer commissure and dividing the external rectus. Before dividing the optic nerve it and the vessels about it are grasped with a small Kocher forceps 1 *cm* behind the ball in order to prevent hemorrhage. In cutting the ciliary nerves care is taken to include the bunch lying under the internal rectus, which may readily be overlooked. When the compression forceps are left for ten minutes there is usually no great exophthalmus. If one per-cent. cocaine solution is injected into the orbit after division of the muscles general anæsthesia is not required. The pain ceases at once and does not return. The tendency of such eyes to diverge is corrected if the divided external rectus is not united with sutures. In the middle of the cornea the epithelium is sometimes cast off and there may be ulceration, but these

soon heal. For two weeks the tension is diminished and later increases again. The author recommends the operation in: (1) absolute glaucoma with pain, to take the place of enucleation; (2) in absolute glaucoma without pain, when iridectomy is impossible; and (3) when, in spite of other operations, pain continues.

XVIII.—SYMPATHETIC OPHTHALMIA.

308. **Alberti.** Clinical reports on sympathetic ophthalmia. *Beitr. z. Augenheilk.*, 47, p. 1.

309. **Jackson, E.** The estimation of the dangers of sympathetic ophthalmitis. *Amer. Jour. of Ophth.*, May, 1901.

ALBERTI (308) reports fourteen cases of sympathetic ophthalmia, of which one is particularly interesting in that it began with detachment of the retina and was cured with complete reattachment and full acuteness of vision.

JACKSON'S (309) paper is a plea for conservative treatment of eyes suspected as being the possible cause of sympathetic ophthalmia. Cases arising long after the original injury or from non-perforating wounds or from eyes which have undergone degeneration without traumatism are undoubtedly sympathetic irritation only, and enucleation is unnecessary.

ALLING.

Sections XIX.–XXII. Reviewed by PROF. GREEFF, BERLIN.

XIX.—RETINA AND FUNCTIONAL DISTURBANCES.

310. **Vossius.** On rupture of the retina at the ora serrata. *Beiträge z. Augenheilk.*, 47.

311. **Römer.** A case of total detachment of the retina from the ora serrata. *Wien. Monatsbl.*, April, 1901.

312. **Obermeier.** A case of bilateral subhyaloid retinal hemorrhage from a fall on the back of the head. *Klin. Monatsbl. f. Augenheilk.*, xxxix., p. 293.

313. **Baer.** An arterial loop passing forward into the vitreous in an eye blind from embolism of the central artery. *Ibid.*, p. 307.

314. **Shaw.** Two cases of tobacco amblyopia. *Ophth. Review*, May, 1901.

315. **Fisher, J. Herbert.** The influence of nicotin on ganglion cells: its bearing on the pathology of tobacco amblyopia. *Ibid.*, June, 1901.

316. **Thompson, E. S.** An unusual case of partial recovery from embolism of the arteria centralis retinæ. *Med. Record*, April 13, 1901.

317. **Hare, H. A.** An obscure case of hysteria associated with right mydriasis and amblyopia, and left myosis. *Amer. Medicine*, April 13, 1901.

318. **De Schweinitz.** A case of methyl-alcohol amaurosis, the pathway of entrance of the poison being the lungs and the cutaneous surface. *Ophth. Record*, June, 1901.

319. **Jackson, E.** Amblyopia from the use of wood alcohol. *Denver Med. Times*, April, 1901.

320. **Dunn, J.** Two cases of amblyopia following the use of Jamaica ginger. *Virginia Med. Semi-Monthly*, Jan. 25, 1901.

Vossius (310) reports two cases of detachment of the retina from the ora serrata with microscopic examination. In each case there had been an injury of the eye, perforating in one, non-perforating in the other. In the case of non-perforating injury the retina was torn off on one side only, while in the case of perforating injury the detachment took place in the entire circumference, and the retina was united to the ball only at the point of scleral perforation where cicatricial tissue had developed. Such detachments are rare, only two cases having been observed previously.

Römer (311) describes a case of total detachment of the retina up to the ora serrata after contusion of the ball. The retina assumed the usual funnel form.

The first of Shaw's (314) cases is interesting on account of the youth of the patient, whose age was fifteen. He was a strong, healthy looking lad who had smoked regularly since he was eight years old. For a year past he had daily consumed five cigarettes. He showed all the regular symptoms of tobacco amblyopia.

The second case was that of a man aged forty, who began to chew when nine, and gradually raised his allowance until he consumed one ounce a day. After he married, when twenty-five, he ceased to chew, and smoked one half to one ounce a day. When about thirty-nine he diminished the amount, and for a year has never smoked more than from one to two ounces a week. Three months ago his sight commenced to fail, and it fell to $\frac{5}{60}$ and $\frac{5}{36}$. Under strychnine and abstinence from tobacco he is improving.

Marshall.

Fisher (315) in this paper draws attention to some experiments of Langley in which he proved that when the animal was under the influence of nicotin, nerve impulses did not pass through the superior cervical ganglion, though their passage along the nerve fibres was not interfered with. The same happened if the ganglion were only painted with the drug.

Arguing from these facts, he quotes some pathological and histological observations which go to prove that the central amblyopia in nicotin poisoning is due to an interruption in the

transmission of these impulses which have to pass through ganglion cells upon which the drug acts.

This explains more satisfactorily than any other theory why direct vision suffers out of all proportion to indirect vision in tobacco amblyopia, as most of the fibres here pass through ganglion cells. MARSHALL.

THOMPSON (316) explains the restoration of vision in one half of the field, in a case of embolism of the central artery, by dislodgment of the embolus and movement into the upper branch, before degeneration had taken place.

ALLING.

DE SCHWEINITZ (318) reports the case of a varnisher, who had been daily exposed to the fumes of methyl-alcohol for two months, and had soaked his hands and forearms in the liquid. He developed symptoms of dizziness, especially when working in a confined place, and had slight disturbances of vision. The acute symptoms developed suddenly, and were those of methyl-alcohol poisoning. Later he became blind. The case is of interest as showing the probable cumulative effect and unusual method of absorption. ALLING.

XX.—OPTIC NERVE.

321. **Oeller.** Orbital phlegmon and atrophy of the optic nerve. *Festschrift*, Erlangen, 1901.

322. **Rehder.** A contribution to the knowledge of the ocular symptoms of tumor of the cerebellum and on the effect of lumbar puncture on choked disc. *Inaug. Dissert.*, Rostock, 1901.

323. **Hertel.** A contribution to the knowledge of angiosclerosis of the central vessels of the eye. *Graefe's Archiv*, liii., p. 191.

324. **Galinowsky.** On endarteritis of the arteria centralis retinæ with the formation of concrements. *Arch. f. Augenheilk.*, xliii., p. 270.

325. **Hummelsheim** and **Leber.** A case of atrophic degeneration of the retina and optic nerve with marked endarteritis of the central artery in diabetes mellitus. *Graefe's Archiv*, lii., p. 336.

326. **Swanzy** and **Earl.** Psammoma of the optic nerve. *Brit. Med. Journ.*, April 13, 1901.

327. **Beard, C. H.** Congenital absence of the optic disc with a condition resembling choked disc. *Ophth. Rec.*, June, 1901.

OELLER (321) examined a peasant who had received a wound in the skull from a dung-fork, which led to erysipelas, orbital phlegmon, bilateral blindness, metastases, and death. At the autopsy there were found neither histological changes nor bacteria in the lids, orbit, or eyeball. The optic nerves behind the lamina

cribrosa were structurally normal, although but few nerve fibres were preserved. The farther backward one went the broader was a segment of the nerve which presented the picture of interstitial neuritis, until at the optic foramen the entire transverse section of the nerves was involved. In the degenerated foci were bacilli lying either isolated or in groups and fascicles like the diphtheria bacillus. The optic-nerve changes were due primarily to an acute necrosis of the nerve trunk. The degeneration had begun in each nerve about in the middle of its orbital course. Under the influence of an acutely acting poison nerve fibres and neuroglia were broken down into detritus at this point. As a reaction for the purpose of eliminating the dead tissue an interstitial inflammation began in the pial sheath and its septa, which, through its products, particularly the fatty granular cells, led to absorption of the degenerated parts. The presence of bacilli indicates the mycotic nature of the process. The author assumes that the pyogenic matters were carried through the lymph passages from the sheaths along the septa of the optic nerve.

Rehder (322) reports three cases of tumor of the frontal lobes with autopsy. Taking previous statistics into consideration, he concludes that the involvement of the optic nerve in cases of frontal brain tumor differs considerably in different cases. The nerve lesion is rarely an early symptom. Choked disc is more frequent in cases of cerebellar tumor, but this sign is of no great value in differential diagnosis.

Lumbar puncture is often followed by unpleasant results, and when the diagnosis of brain tumor is assured it may be a dangerous proceeding.

Hertel (323) examined twelve eyes of patients who had had angiosclerosis of high degree without marked general symptoms. The ocular changes were relatively slight. Hertel examined the eyes together with the nerves up to the chiasm in order to find in what way and to what degree sclerosis of the vessels of the body involved those of the retina. The condition of the elastic elements was studied particularly. It was found that in normal eyes the elastic fibres increase with age. In old people there is between endothelium and muscular coat a thickened elastica interna. This condition was found constantly in the patients with angiosclerosis, but it is to be regarded perhaps merely as a sign of age. An increase of elastic fibres is found in the nerve sheaths also. Comparison of preparations from normal persons with those from per-

sons with angiosclerosis showed that as regards the thickness and structure of the walls of the central vessels and also as regards the lumen the conditions were fairly similar in the two.

However, there was found constantly a nodular thickening of the intima of the arteries encroaching upon the lumen and narrowing it considerably at points. These nodules consisted for the most part of elastic fibres with some intervening connective tissue. Furthermore, there were found inflammatory changes occasionally in the arterial walls and even more frequently in the venous walls. Often the wall of the vein was folded so that the folds projected into the lumen.

The sclerotic changes, therefore, are characterized by inflammatory signs and processes of proliferation. The sclerotic process in the central vessels of the eye is to be considered a slow proliferation dependent upon a chronic inflammatory basis. From his cases it appears that the local changes in the vessel walls may at times be pronounced without evident changes in circulation or vision.

In HUMMELSHEIM and LEBER'S (325) case the diagnosis lay between glaucoma and optic-nerve trouble until the anatomical examination revealed an atrophy and a pronounced endarteritis of the central artery. Years later the patient died of apoplexy. The retina was thin and degenerated in all its layers. In transverse sections the central artery and vein in the nerve were inclosed in a thick adventitial sheath. The wall of the artery was as thick as normal, but the lumen was well preserved. Beneath the endothelium there was a layer of wavy elastic fibres. The thickening of the vessel wall was chiefly in the intima. The author believed that the endarteritis was dependent upon a diabetes.

In SWANZY and EARL'S (326) case the growth was removed from the orbit by Knapp's method. It measured 1½ inches wide, filled the orbit, and caused very marked proptosis. The eye was blind from optic atrophy.

The tumor was composed of small round mononuclear cells with very little fibrous tissue. The optic-nerve fibres could be traced through and over the surface of the tumor. There were numerous calcified bodies of various sizes as well as masses of hyaline material. Mr. Swanzy did not think the operation very suitable for this class of case as the eye was useless and owing to degenerative changes he did not expect it would be even ornamental.

MARSHALL.

BEARD'S (327) case presented appearances of choked disc, which remained unchanged for seven years. ALLING.

XXI. — INJURIES, FOREIGN BODIES, PARASITES.

328. **Pechim.** Traumatic atrophy of the optic nerve. *Rév. génér. d'opht.*, xx., p. 49.

329. **Bouchart.** Contusion of the eye and the refractive errors to which it gives rise. *Rec. d'opht.*, 1901, 1.

330. **Stephen.** A contribution to the diagnosis of echinococcus of the orbit. *Inaug. Dissert.*, Rostock, 1901.

331. **Gallemaerts.** Ocular cysticercus. *Policlinique de Bruxelles*, Jan. 15, 1901.

332. **Beard.** Qûeer behavior of a bit of glass within the eye. *Amer. Journ. of Ophth.*, May, 1901.

333. **Hawley.** Successful removal of steel from the vitreous. *Ophth. Record*, May, 1901.

334. **Weill.** Extraction of iron from the interior of the eye by the Haab electro-magnet. *Ibid.*, Feb., 1901.

STEPHEN (330) describes a case of echinococcus of the orbit with enormous exophthalmus. It is the first case in which the Krönlein operation was employed to remove an echinococcus.

BEARD'S (332) patient was injured by the explosion of a glass globe. After six weeks, during which time he suffered from attacks of iritis, a bit of glass appeared in the anterior chamber and was extracted. The author believes that the foreign body had been lying back of the iris. ALLING.

XXII. — OCULAR AFFECTIONS IN GENERAL DISEASES.

335. **Peters.** On fundus changes in pneumonia. *Klin. Monatsbl. f. Augenheilk.*, xxxix., p. 392.

336. **Pichler.** On the symptomatology of rheumatism (tendinitis rheumatica ocularis). *Münch. med. Wochenschr.*, May 7, 1901.

337. **Courmont** and **Rollet.** Variolous ophthalmia and its abortive treatment. *Ann. d'ocul.*, cxxv., p. 346.

338. **Dufour.** On the treatment of the ocular complications of variola. *Ibid.*, p. 335.

339. **Chauvel.** Neuritis and retinal thrombosis of malarial origin. *Bull. de l'acad. de méd. de Paris*, May 14, 1901.

340. **Bietti.** Ocular disturbances in gout. *Klin. Monatsbl. f. Augenheilk.*, xxxix., p. 337.

341. **Garafalo.** On the gouty affections of the eye. *Wiener med. Wochenschr.*, Sept. 8, 1901.

342. **Simonin.** Partial external ophthalmoplegia of peripheral origin at the beginning of measles. *Bull. de soc. méd. des Hôpitaux de Paris*, June 21, 1901.

343. **Pechim.** Ocular complications of mumps (iritis and keratitis). *Rec. d'opht.*, 1901, No. 6.

344. **Rendu.** Hemianopsia in patients with arterial sclerosis and interstitial nephritis. *Sem. méd.*, xxi., No. 25.

345. **Sulzer.** Early pupillary symptoms of acquired syphilis. *Ann. de dermatol. et de syph.*, March, 1901.

346. **Robert.** Hemeralopia in general diseases. *Thesis*, Lyon, 1901.

347. **Pitres.** Lumbar puncture in a case of cerebral tumor. *Bull. de la soc. de méd. et de chir. de Bordeaux*, March 8, 1901.

348. **Le Prince.** Corneal and iridic affections of malarial origin. *Ann. d'ocul.*, cxxv., p. 355.

349. **Sattler.** The ocular expression of intranasal lesions. *Journ. Amer. Med. Assoc.*, May 18, 1901.

350. **Vail.** Optic neuritis from intranasal disease. *Amer. Journ. of Ophth.*, May, 1901.

PETERS (335) describes two cases of pneumococcus ocular metastases in pneumonia. It has long been known that in pneumonia metastatic ophthalmia may occur in the form of chorioretinitic foci which may lead to blindness. Peters's patients recovered. He suggests that ophthalmoscopic examination be made more frequently in pneumonia.

Among 671 cases of variola COURMONT and ROLLET (337) observed conjunctival or corneal affections in forty-five. In the cases of corneal infiltration methylene blue acted very well. Furthermore paralysis of accommodation was seen in two cases and optic neuritis in one. In the latter case vision improved but great contraction of the field remained. BERGER.

In a woman of twenty-eight who had never been vaccinated DUFOUR (338) observed in the course of variola an eruption at the sclero-corneal junction which led to corneal ulcer with hypopyon. After three subconjunctival injections of bichloride the ulcer healed, leaving a leucoma. BERGER.

CHAUVEL (339) believes that in Galezowski's cases of optic-nerve disease caused by malaria the checking of the progress of the amblyopia was not proof of a malarial cause. Nor would Galezowski's therapy prove malaria, since both quinine and mercurial inunctions were used and the latter alone might have brought about the improvement. BERGER.

SIMONIN (342) observed in a patient of twenty-one during the eruption of measles the development of ptosis and paresis of the left external rectus. These symptoms, referable to a peripheric nerve affection, disappeared in the course of twenty days. BERGER.

SULZER (345) calls attention to the frequency of anomalies of pupillary reaction in the early stage of syphilis. Among fifty-three cases there was Argyll-Robertson pupil in eleven and in two both light and accommodation reflexes were lost, while the accommodation was preserved. In several cases Sulzer could follow the development of the pupillary anomaly, which came on gradually in four to six weeks. These disturbances may appear within three months of the primary affection. In general they seem to be transitory. BERGER.

In a case of brain tumor in a patient aged thirty-five PITRES (347) found after lumbar puncture and the evacuation of 20 *cc* of cerebrospinal fluid a marked improvement in the general symptoms and in the excessive choked discs. BERGER.

LE PRINCE (348) speaks of the rarer ocular affections in malaria, such as iritis and keratitis parenchymatosa and dendritica, and he reports in detail a case of the last affection which with every attack of fever underwent exacerbations, and was finally cured with quinine with $\frac{20}{40}$ vision in each eye. BERGER.

SATTLER (349) believes that cases of persistent injection of the vessels of the ocular conjunctiva, as well as some cases characterized by neuralgic pains in the orbit, are often due to intranasal complications. ALLING.

VAIL (350) believes that the nose is often overlooked as the cause of acute diseases of the optic nerve and eyeball. The striking features of acute fulminating retrobulbar neuritis from nasal origin are as follows: Comparatively rapid onset, course, and termination; excruciating pain, involving the first division of the fifth nerve; complete loss of vision with more or less atrophy; absence in many cases of positive evidence of nasal trouble.

ALLING.

MISCELLANEOUS NOTES.

In October, 1901, an Ophthalmological Society was formed in Copenhagen. Prof. BJERRUM was elected president, Dr. LUNDSGAARD secretary.

Mr. GEORGE ANDERSON CRITCHETT, F. R. C. S. Ed., Senior Ophthalmic Surgeon to St. Mary's Hospital, London, has been made a Baronet.

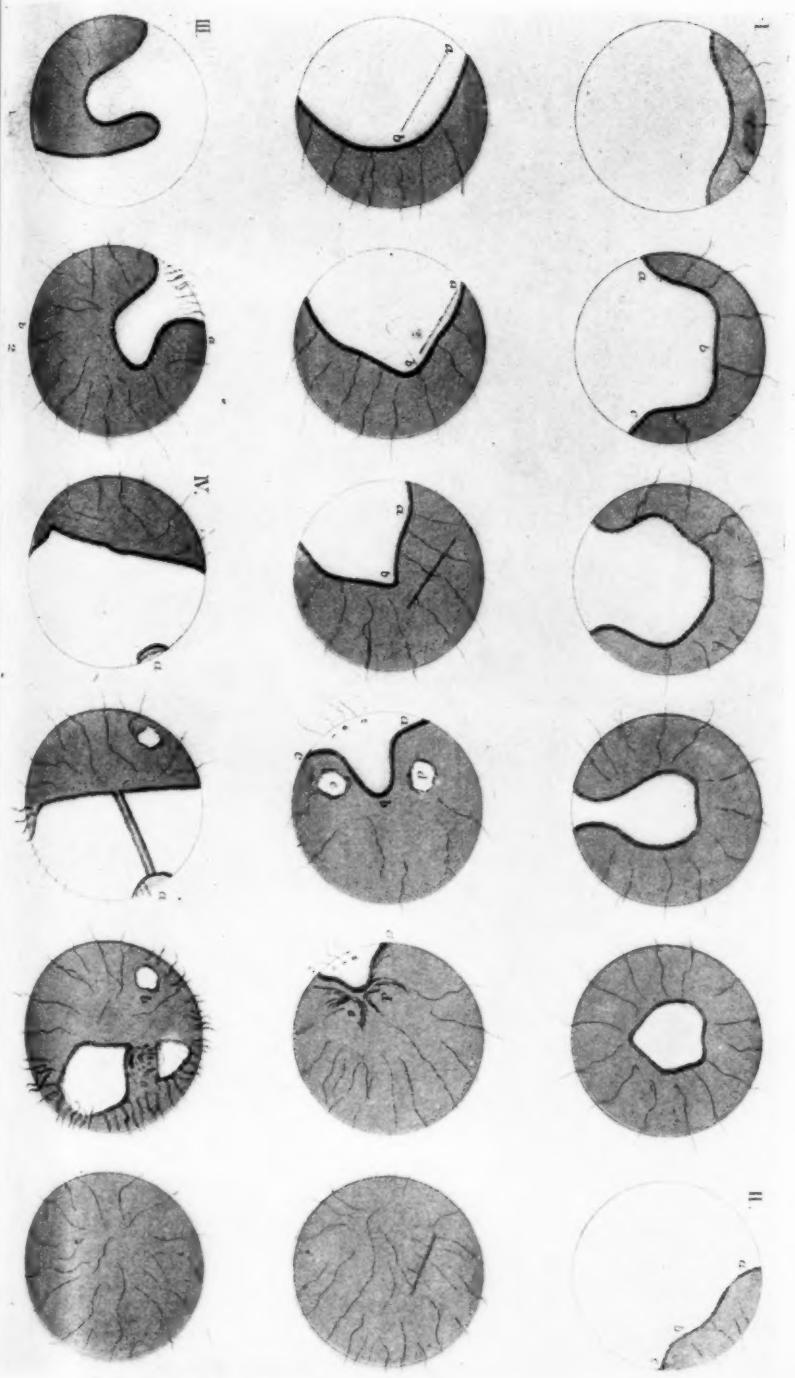
Dr. GEORGE E. DE SCHWEINITZ, professor of ophthalmology, Jefferson Medical College, Philadelphia, has been unanimously elected professor of ophthalmology in the University of Pennsylvania, to succeed the late Prof. WM. F. NORRIS.

Mrs. HARRIET BACON SMITH has bequeathed $10,000 to the Brooklyn Eye and Ear Hospital.

Mr. CHAS. H. HADEN, of Boston, has bequeathed $50,000 to the Massachusetts Eye and Ear Hospital.

The Board of Trustees of the New York Ophthalmic and Aural Institute have secured a suitable site for a new home of this institution, not far from the College of Physicians and Surgeons.

Prof. HAAB of Zurich has decided to pay a visit of four weeks to America. He is expected to arrive with the *Kronprinz Wilhelm* at New York, May 27th. He will attend the meeting of the American Medical Association at Saratoga, and visit the principal medical centres of this country.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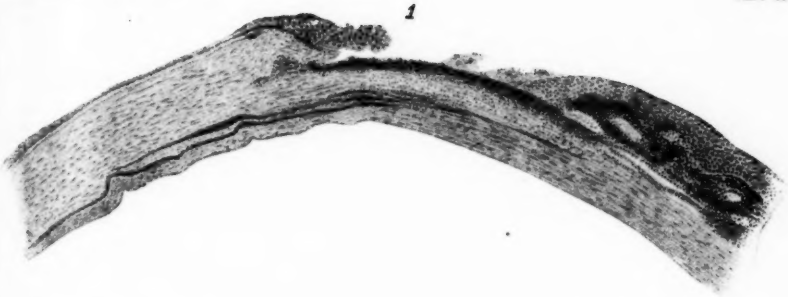

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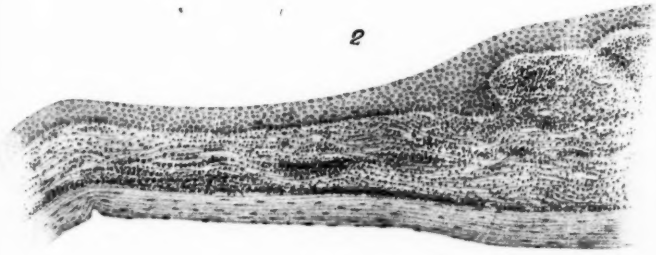

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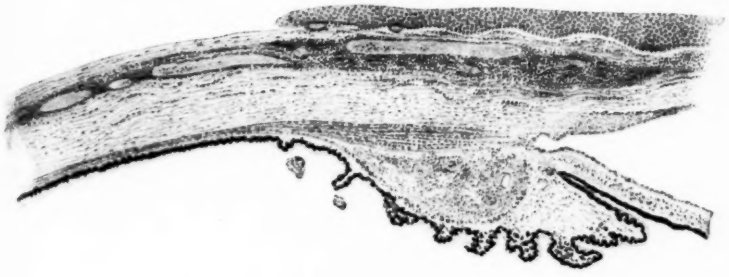
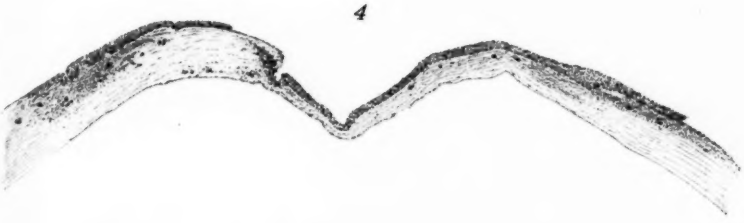
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